

**Model DC100  
Communication Interface  
Instruction Manual**

IM DC100-11E

IM DC100-11E  
4th Edition

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## **Introduction**

This Communication Interface User's Manual describes the functions and commands of the optional GP-IB, RS-232-C, RS-422-A/RS-485, and Ethernet interfaces. Read this manual carefully before using these interface functions, and be sure to keep this manual on hand for future reference should any problems arise.

As a manual relative to the DC100, the following manual is also provided. Read it if necessary.

<b>Name of manual</b>	<b>Manual No.</b>
DC100 Data Collector User's Manual	IM DC100-01E

## **Note**

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## **History**

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## ***Configuration and Use of This Manual***

### **Configuration**

This user's manual is composed of chapter 1 to chapter 8, an appendix and indices.

#### **Chapter 1 Overview and Specifications of GP-IB Interface**

Describes the functions and specifications of the GP-IB interface and the address setting method.

#### **Chapter 2 Overview and Specifications of RS-232-C Interface**

Describes the functions and specifications of the RS-232-C interface and the parameter setting method.

#### **Chapter 3 Overview and Specifications of RS-422A/RS-485 Interface**

Describes the functions and specifications of the RS-422-A/RS-485 interface and the parameter setting method.

#### **Chapter 4 Overview and Specifications of Ethernet Interface**

Describes the functions and specifications of the Ethernet interface and the parameter setting method.

#### **Chapter 5 Command Format**

Describes how to specify command formats and channel numbers.

#### **Chapter 6 Commands**

Describes the commands for various setting items, commands for executing actions, data request commands for measured data saved in memory, or commands requesting output of internally set data.

#### **Chapter 7 Output Format**

Describes the output formats for set data, measured data, etc.

#### **Chapter 8 Sample Program**

Useful sample programs are presented.

#### **Appendix Computation Equation**

Describes the optional computation equation.

#### **Index**

There are command and general indices.

This user's manual does not describe in detail connections and functions for the DC100 systems.

For details on these, see the following separate manual:

“DC100 Data Collector User's Manual”

IM DC100-01E

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## 1.1 Description of Functions (GP-IB)

### *Listener and Talker Functions*

#### **Listener Function**

This allows almost all settings except power on/off and operation control.

- Settings except communication settings.
- Operation control except power on/off.
- Call-up of setting data
- Specifying of output data (specifying of channel numbers or output data types)
- Specifying of causes of interrupt generation (see IM command: page 6-20)

#### **Talker Function**

The following data can be output:

- Measured data
- Data on RAM disk
- Report data
- Computed data
- System configuration
- Data for operation mode setting
- Data for setup mode setting

For measured data, data on RAM disk and computed data, either binary output or ASCII output can be selected. Report data are output in binary format. Other data are output in the form of ASCII data.

#### **Data Output**

When trigger (GET) becomes activated, DC100 will store the new data in a buffer. When an output request such as the FM command is received, these new data will be output.

Note when dividing and reading in data output from DC100 with the personal computer:

The data group being read in after ATN\* has just become TRUE may miss its first bite.

Example of N88-BASIC (Standard language for PC9801 series)

Dividing and reading in measured data by every line

```
70 PRINT @1; "FM0, 001,010"
80 LINE INPUT @1; D$: PRINT D$
90 LINE INPUT@1; D$: PRINT D$
100 IF MID$ (D$, 2, 1)<>"E" THEN 90
```

Because the specification of talker address is repeated in the line 90 LINE INPUT@1; D\$:PRINT D\$, ATN becomes TRUE before the third data group being read in.

Precaution:

```
70 PRINT @1; "FM0, 001,010"
80 LINE INPUT @1; D$: PRINT D$
90 LINE INPUT@; D$:PRINT D$
100 IF MID$ (D$,2,1)<>"E" THEN 90
```

The command is changed into LINE INPUT@; D\$:PRINT D\$ in the line 90.

ATN won't become TRUE if the specification of talker address is not repeated.

It's unnecessary to repeat the specification when reading in data from the same address.

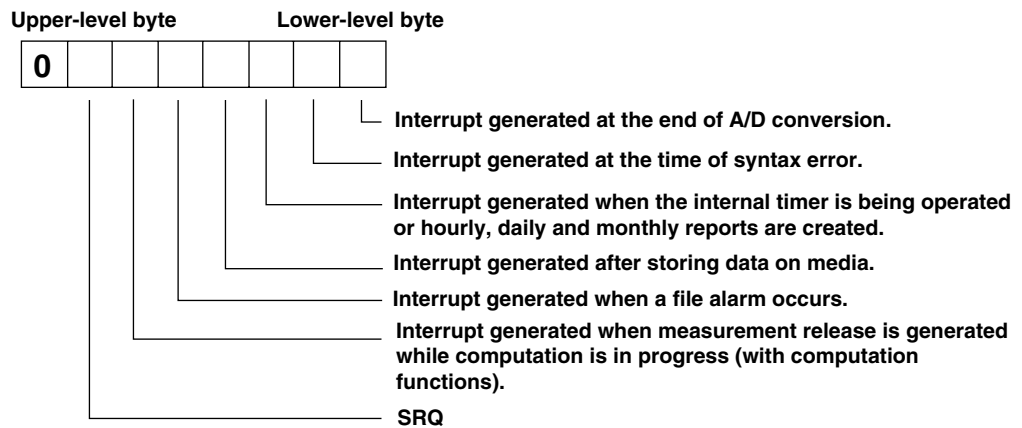
\* ATN is a signal for data distinction:

TRUE (0) Device message

FALSE (1) Interface message

## Status Byte Format

The format of status byte output in serial polling is as follows:



Bit 8: Not used. Always 0.

Bit 7: SRQ

This bit changes to 1 when any cause of the bits 1 to 6 has been generated and interrupts the controller. After responding to serial polling, this bit is set to 0.

Bit 6: This bit changes to 1 when a measurement release is generated while the computation is in progress; otherwise, it is 0. This bit is effective only with optional computation functions. After responding to serial polling, this bit is set to 0.

Bit 5: This bit changes to 1 when a file alarm occurs. After responding to serial polling, this bit is set to 0.

Bit 4: This bit changes to 1 after storing data on media ; otherwise, it is 0. After responding to serial polling, this bit is set to 0.

Bit 3: This bit changes to 1 when the internal timer is being operated or hourly, daily and monthly reports are created. Whenever one of the internal timers 1 to 6 is being used or reports are created, the bit changes to 1. After serial polling has been performed, this bit will be reset to 0.

Bit 2: This bit changes to 1 when a syntax error occurs in a command and is normally 0.

If there is an error in a command description, this changes to 1. After responding to serial polling, this bit is set to 0.

Bit 1: This bit changes to 1 at the end of an A/D conversion; otherwise, it is 0.

When the A/D conversion of measured data is terminated, this changes to 1. After responding to serial polling, this bit is set to 0.

### Status byte and serial polling

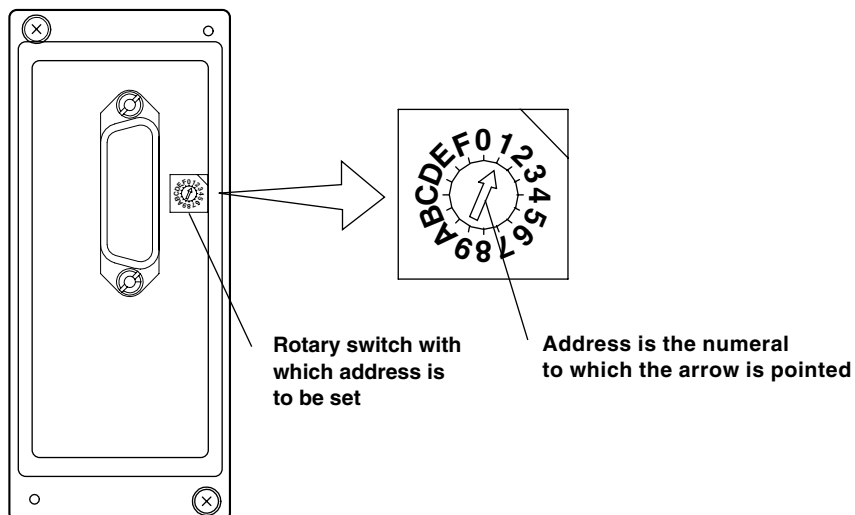
- In IM commands, the bit status that is to be made effective must be specified. The status of unspecified bits does not change to 1.
- If a new cause is generated before reading out a status byte for which a cause has already been generated, the existing cause remains in the status byte as is and the new cause is added. For example, if bit 1 is in 1 state and bit 2 is newly changed to 1 before reading out the status byte, both bit 1 and bit 2 become 1.

### The initial value

The initial value is ' IM2 '.

## 1.2 Setting of Address of GP-IB Interface

The GP-IB address is set with the rotary switch located on the side of the GP-IB module connector. Turn the arrow on the rotary switch with a flat-blade screwdriver or the like to align the arrow with the address to be set.



## 1.3 Specifications

Electrical and mechanical specifications: Conforming to IEEE St'd 488-1975

Code to be used: ISO (ASCII) code

Function specifications

Function	Subset name	Description
Source handshake	SH1	All transmission handshake functions operative
Acceptor handshake	AH1	All transmission handshake functions operative
Talker	T6	Basic talker functions, serial poll, and talker release function by listener are provided.
Listener	L4	Basic listener function and listener release function by talker are provided.
Service request	SR1	All service request functions operative
Remote/local	RL1	All remote/local functions operative
Parallel poll	PP0	No parallel poll function
Device clear	DC1	All device clear functions operative
Device trigger	DT1	All device trigger functions operative
Controller	C0	No controller function

## 2.1 Description of Functions (RS-232-C)

### *Listener and Talker Functions*

#### **Listener Function**

This allows almost all settings except power on/off and operation control.

- Settings except communication settings.
- Operation control except power on/off.
- Call-up of setting data
- Specifying of output data (specifying of channel numbers or output data types)

#### **Talker Function**

The following data can be output:

- Measured data
- Data on RAM disk
- Report data
- Computed data
- System configuration
- Data for operation mode setting
- Data for setup mode setting

For measured data, data on RAM disk and computed data, either binary output or ASCII output can be selected. Report data are output in binary format. Other data are output in the form of ASCII data.

#### **Data Output**

When trigger (GET) becomes activated, DC100 will store the new data in a buffer. When an output request such as the FM command is received, these new data will be output.

### Commands Applicable to RS-232-C Only

The following commands are only applicable to RS-232-C.

**ESC T Trigger Execution**

Setting ESC T<terminator>

Description Before executing this command, select the output data using the TS command. The data selected with the TS command are prepared for output. The data are output with the FM, LF, CF, MF or RF command.

**ESC S Status Output Command**

Setting ESC S<terminator>

Description The status for a sent command is output.

**ESC R Switch from Local Status to Remote Status**

Setting ESC R<terminator>

Description

- Panel setting conditions in the local status are retained even if the status is switched to the remote status.
- When the status is switched to the remote status, no key except DISP can be used. Panel operation can be done by pressing the DISP key or switching the status to local using the ESC L command described below.

**ESC L Switch from Remote Status to Local Status**

Setting ESC L<terminator>

Description The panel setting conditions in the remote status are retained even if the status is switched to the local status.

**Note**

- 
- ESC corresponds to hexadecimal code (1B)H.
- 

### Status Byte Format

When the status byte output command (ESC S) is received, any of the ER00CRLF to ER03CRLF status will be output.

ER□□CrLf

An ASCII character string of a numeral (numerals) shown in parentheses at the end of any of the following items or the sum of the numerals of the relevant items is output. For example, if a file alarm and timer operation occur, ER20CrLf is output. Items not specified with an IM command are invalid and not included in this status output.

- **A/D conversion end (1)**  
When an A/D conversion for measured data ends, “1” is output.
- **Syntax error (2)**  
If an error occurs in the description of a command, “2” is output.
- **Internal timer or time when hourly, daily and monthly reports are created(4)**  
If any of the 6 timers (1 to 6) or the time for hourly, daily and monthly reports arrives set with an auxiliary mask operates, “4” is output.
- **Storing data end (8)**  
When storing data on media ends, “8” is output.
- **File alarm (16)**  
If a file alarm is detected, “16” is output.
- **Measurement release (32)**  
If a measurement release is generated while the computation is in progress, “32” is output.

### Items Applicable to RS-232-C Only

With RS-232-C, all commands can be acknowledged by ACK output. The ACK output is as follows, except for the FM, LF, CF, RF, MF, BL and \_M commands, whose ACK output will be described later on.

E0 : Commands are processed successfully

E1 : Commands are not processed successfully

After having sent the output request, make sure to retrieve the data.

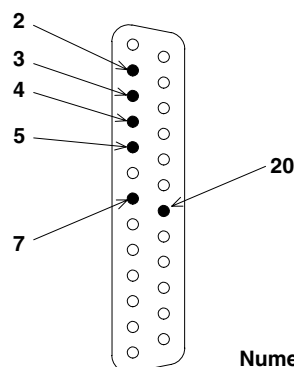
## 2.2 Specifications

Electrical & mechanical specs	: Conform to the EIA RS-232-C Standard.
Connection format	: Point-to point
Communication format	: Half duplex
Synchronizing format	: Start-stop asynchronous transmission (synchronized by start/stop bit)
Baud rate (bps)	: 150, 300, 600, 1200, 2400, 4800, 9600, 19200, or 38400 (selectable)
START bit	: 1 bit, fixed.
Data length	: Either 7 or 8 bits (selectable).
Parity	: Even, Odd, or None (selectable).
STOP bit	: Either 1 or 2 bits (selectable).
Connector	: DBSP-JB25S (JAE)
Hardware handshake	: Transmission/reception control by DTR, RTS, CTS.
Software handshake	: Transmission control by XON, XOFF.
Reception buffer length	: 200 bytes
Escape sequence	: Trigger; Status call.

## 2.3 RS-232-C Interface Connection

When connecting this instrument to a personal computer, first it is necessary to match settings such as handshake format, data transmission speed, and data format at the computer's side. For details relating to these settings, refer to the description on this and following pages. Furthermore, make sure to use an interface cable which matches this instrument's specifications.

### Connector and Signal Names

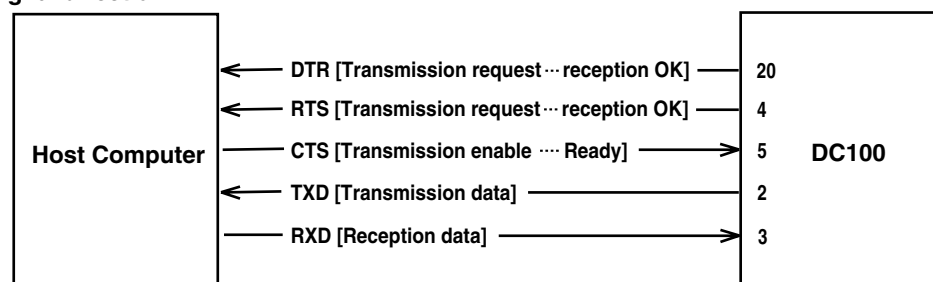


Numeric values in the above figure indicate Pin Nos.

- |                                 |   |
|---------------------------------|---|
| <b>2.TXD (Send Data)</b>        | : Data transmitted to the host computer.<br>Signal direction : Output.                              |
| <b>3.RXD (Received Data)</b>    | : Data received from the host computer.<br>Signal direction : Input.                                |
| <b>4.RTS (Request to Send)</b>  | : Handshake signal used for reception of data from the host computer.<br>Signal direction : Output. |
| <b>5.CTS (Clear to Send)</b>    | : Handshake signal used for transmission of data to the host computer.<br>Signal direction : Input. |
| <b>7.GND (Signal Ground)</b>    | : Signal ground connection.   |
| <b>20.DTR (Equipment Ready)</b> | : Handshake signal used for reception of data from the host computer.<br>Signal direction : Output. |

Pin Nos. 1, 6, 8 to 19 and 21 to 25 are not used.

### Signal direction



RS-232-C Signal List and Corresponding JIS & CCITT Abbreviation

Signal Table

Pin No.	Abbreviation			Name
	RS-232-C	CCITT	JIS	
7	AB(GND)	102	SG	Signal ground
2	BA(TXD)	103	SD	Transmitted data
3	BB(RXD)	104	RD	Received data
5	CB(CTS)	106	CS	Transmission enable
4	CA(RTS)	105	RS	Transmission request
20	CD(DTR)	108/2	ER	Data terminal ready

## 2.4 Handshake Format Selection

In order to ensure proper data transfers between the instrument and the host computer via the RS-232-C interface, a mutual procedure is required for processing the electrical signals. Such a procedure is referred to as a 'handshake'. Several handshake formats are available, with selection depending on the host computer being used. The same handshake format must be designated for both the instrument and the host computer.

The instrument's parameter settings permit any one of the following 5 formats to be selected.

Format Selection	Transmission Data Control (Control format when transmitting data to the host computer)			Reception Data Control (control format when receiving data from the host computer)		
	Software Handshake	Hardware Handshake	No Handshake	Hardware Handshake		No Handshake
	Transmission is stopped when X-OFF is received, and is resumed when X-ON is received.	Transmission is stopped when CTS is FALSE, and is resumed when CTS is TRUE.		When reception of data becomes impossible DTR becomes FALSE, when data reception becomes possible DTR becomes TRUE.	When reception of data becomes impossible RTS becomes FALSE, when data reception becomes possible RTS becomes TRUE.	
OFF-OFF			○			○
XON-RTS	○			○		
XON-DTR	○				○	
CTS-RTS		○		○		
CTS-DTR		○			○	

### OFF-OFF

- Transmission data control : There is no handshake status between the instrument and host computer. the X-ON and the X-OFF signal from the host computer is processed as data, and the CTS signal is ignored.
- Reception data control : There is no handshake status between the instrument and host computer. When the instrument's reception buffer becomes full, the excess data is discarded.  
DTR=True, RTS=True (both fixed).

### Note

- It is necessary to create a host computer program which prevents the instrument and host computer's reception buffers from becoming full.

### XON-RTS

- Transmission data control : A software handshake status is established between the instrument and the host computer. The instrument will stop a data transmission when an X-OFF signal is received from the host computer. The transmission will be resumed when the next X-ON signal is received.  
The CTS signal from the host computer is ignored.
- Reception data control : A hardware handshake status is established between the instrument and the host computer. When the instrument's reception of data becomes impossible, an 'RTS=False' status will be established. When data reception becomes possible, an 'RTS=True' status will be established. DTR=True (Fixed).

XON-DTR

- Transmission data control : A software handshake status is established between the instrument and the host computer. The instrument will stop a data transmission when an X-OFF signal is received from the host computer. The data transmission will be resumed when the next X-ON signal is received. The CTS signal from the host computer is ignored.
- Reception data control : A hardware handshake status is established between the instrument and the host computer. When the instrument's reception of data becomes impossible, an 'DTR=False' status will be established. When data reception become possible, an 'DTR=True' status will be established.  
RTS=True (Fixed).

CTS-RTS

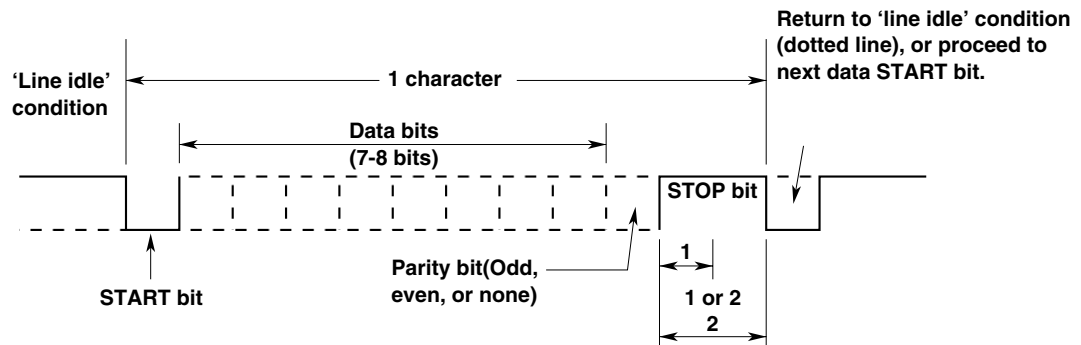
- Transmission data control : A hardware handshake status is established between the instrument and the host computer. The instrument will stop a data transmission if a 'CTS=False' status is established, and will resume the transmission when a 'CTS=True' status is established. The X-OFF and X-ON signals from the host computer are processed as data.
- Reception data control : A hardware handshake status is established between the instrument and the host computer. An 'RTS=False' status will be established when the instrument's reception of data becomes impossible, and an 'RTS=Ture' status will be established when data reception becomes possible. DTR=Ture (Fixed).

CTS-DTR

- Transmission data control : A hardware handshake status is established between the instrument and the host computer. The instrument will stop a data transmission if a 'CTS=False' status is established, and will resume the transmission when a 'CTS=True' status is established. The X-OFF and X-ON signals from the host computer are processed as data.
- Reception data control : A hardware handshake status is established between the instrument and the host computer. A 'DTR=False' status will be established when the instrument's reception of data becomes impossible and a 'DTR=True' status will be established when data reception becomes possible. RTS=Ture (Fixed).

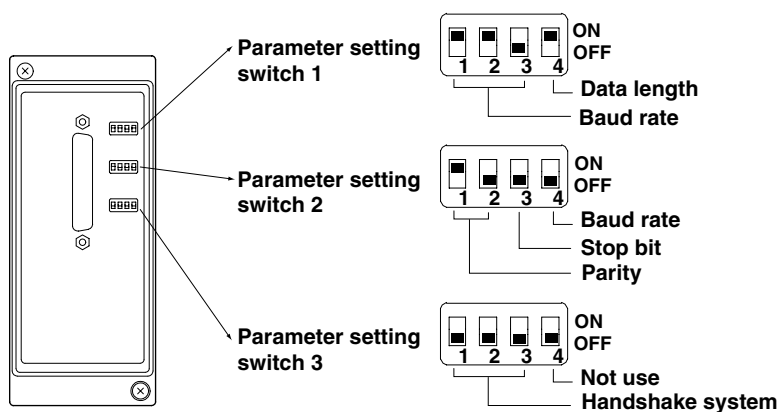
## 2.5 Communication Data Format

The RS-232-C interface uses a START-STOP communication format. With this format, a START bit is placed at the beginning of each character transmitted, followed by the data bits, parity bit, and stop bit, in that order. (See the figure below.)



## 2.6 RS-232-C Interface Parameter Setting Procedure

Setting of the RS-232-C parameters must be carried out using the 3 dipswitches located next to the module connector.



### Baud rate ( No.1 to 3 of setting switch 1 and No.4 of setting switch 2)

Baud rate	No.1	No.2	No.3	No.4 (Switch 2)
150	OFF	OFF	OFF	OFF
300	OFF	OFF	ON	OFF
600	OFF	ON	OFF	OFF
1200	OFF	ON	ON	OFF
2400	ON	OFF	OFF	OFF
4800	ON	OFF	ON	OFF
9600	ON	ON	OFF	OFF
19200	ON	ON	ON	OFF
38400	OFF	OFF	OFF	ON

### Data length (Switch No.4 of parameter setting switch 1)

Data length	No.4
7	OFF
8	ON

### Parity (Switch No.1 and 2 of parameter setting switch 2)

Parity	No.1	No.2
NONE	OFF	OFF
ODD	OFF	ON
EVEN	ON	OFF

### Stop bit (Switch No.3 of parameter setting switch 2)

Stop bit	No.4
1	OFF
2	ON

### Handshake system (Switch No.1 to 3 of parameter setting switch 3)

Handshake system	No.1	No.2	No.3
No handshake	OFF	OFF	OFF
XON-ER*	OFF	OFF	ON
XON-RS*	OFF	ON	OFF
CS-ER	OFF	ON	ON
CS-RS	ON	OFF	OFF

\* When the baud rate is set to 38400, there is no handshaking

## 3.1 Description of Functions (RS-422-A/RS-485)

### Listener and Talker Functions

#### Listener Function

This allows almost all settings except power on/off and operation control.

- Settings except communication settings.
- Operation control except power on/off.
- Call-up of setting data
- Specifying of output data (specifying of channel numbers or output data types)

#### Talker Function

The following data can be output:

- Measured data
- Data on RAM disk
- Report data
- System configuration
- Data for operation mode setting
- Data for setup mode setting

For measured data and data on RAM disk, binary output or ASCII output can be selected. (for RS-422-A with using the multi point.) Report data are output in binary format. Other data are output in the form of ASCII data.

#### Data Output

When trigger (ESC T) becomes activated, DC100 will store the new data in a buffer. When an output request such as the FM command is received, these new data will be output.

### Commands Applicable to RS-422-A/RS-485 Only

The following commands are only applicable to RS-422-A/RS-485.

#### ESC O Open Command (address a communication destination)

Setting ESC O xx<terminator>

xx : address, 01 to 31

Description Specifies the communicating device by its address. When this command is executed, all commands to the DC100 (including ESC T) become effective.

- Only one device can be opened.
- Executing ESC O automatically closes all opened devices.
- When the DC100 receives this command correctly, it sends "ESC O xx" in response to the computer.
- CR+LF can only used for the terminator.

#### ESC C Close Command (close the addressed state of a device)

Setting ESC C xx<terminator>

xx : address, 01 to 31

Description Disconnects the device currently connected. When this command is executed, it allows opening communication with other devices with the ESC O command.

- When the DC100 receives this command correctly, it sends "ESC C xx" in response to the computer.
- CR+LF can only used for the terminator.

The following commands are same as the RS-232-C interface. For details, refer to page 2-2.

#### ESC T (Trigger Execution), ESC S (Status Output Command)

#### Note

- ESC corresponds to hexadecimal code (1B)H. On the N88-BASIC, "ESC x" is denoted as "CHR\$( &H1B )+"x".

---

## 3.2 Specifications

Electrical & mechanical specs	: Conform to the EIA RS-422-A and EIA RS-485 Standard
Connection format	: Multi-drop 1:n (n=16 for RS-422-A, n=31 for RS-485)
Communication format	: Half duplex
Synchronizing format	: Start-stop asynchronous transmission (synchronized by start/stop bit)
Baud rate (bps)	: 300, 600, 1200, 2400, 4800, 9600, 19200, or 38400 (selectable)
START bit	: 1 bit (fixed)
Data length	: Either 7 or 8 bits (selectable)
Parity	: Even, Odd, or None (selectable)
STOP bit	: Either 1 or 2 bits (selectable)
Connector	: 6 point screw type terminal (uses M4 screws)
Minimum response time	: 0, 10, 20, 50 or 100 ms (selectable)
Reception buffer length	: 250 bytes
Escape sequence	: Trigger, Status call, Open and Close
Electrical characteristics	: SDA, SDB, RDA, RDB, SG. Between the signal terminal and the main internal circuit is insulated functionally.
Communication distance	: 1.2 km maximum
Terminator	: Internal resistor (120 ohm, 1W) switch with the slide switch

### 3.3 RS-422-A/RS-485 Interface Connection

The following explains how the RS-422-A/RS-485 module is connected to the computer.

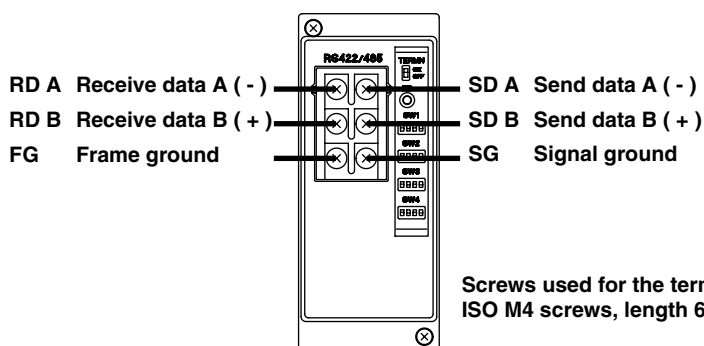
#### Cable Used

There are two types of cables: two-wire cable and four-wire cable. Make sure each type meets the following conditions.

Cable used	: twisted pair shielded cable 2 pairs of 24 AWG minimum (two-wire), 3 pairs 24 AWG minimum (four-wire)
Characteristic impedance	: 100 ohm
Capacitance	: 50 pF/m
Length of cable	: 1.2 km maximum *

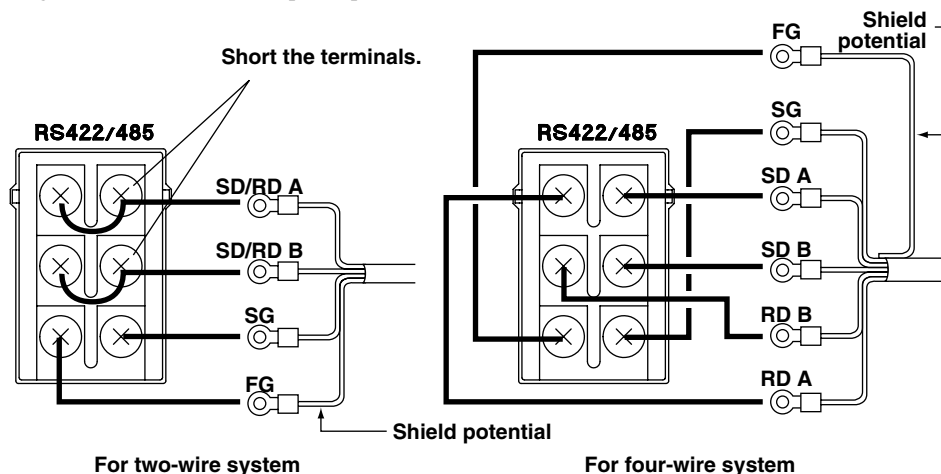
\* Communication distance of the RS-422-A/RS-485 interface is not the linear distance, but the total length of the cable (shielded twisted pair cable).

#### Terminal Arrangement of the RS-422-A/RS-485 Module



#### Connecting the Cable

Attach crimp-on lugs (for 4 mm screws) with insulation sleeves on the leadwire ends as shown in the diagram below. Make the exposed portion of the shielded cable to be less than 5 cm.



#### WARNING

To prevent an electric shock, ensure the main power supply is turned OFF.

#### Note

- As shown on the next page, connect terminal RD to SD(TD) of the computer (converter) and terminal SD to RD of the computer.

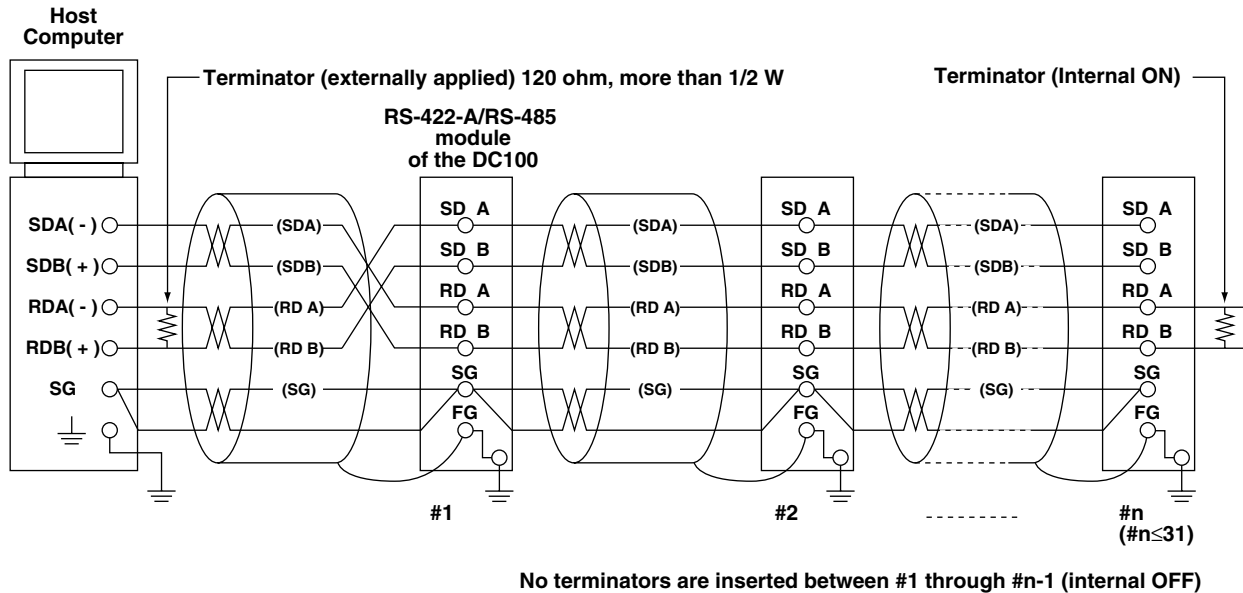
#### Connecting to the Host Computer

Can be connected to a host computer with RS-232-C, RS-422-A, RS-485 ports.

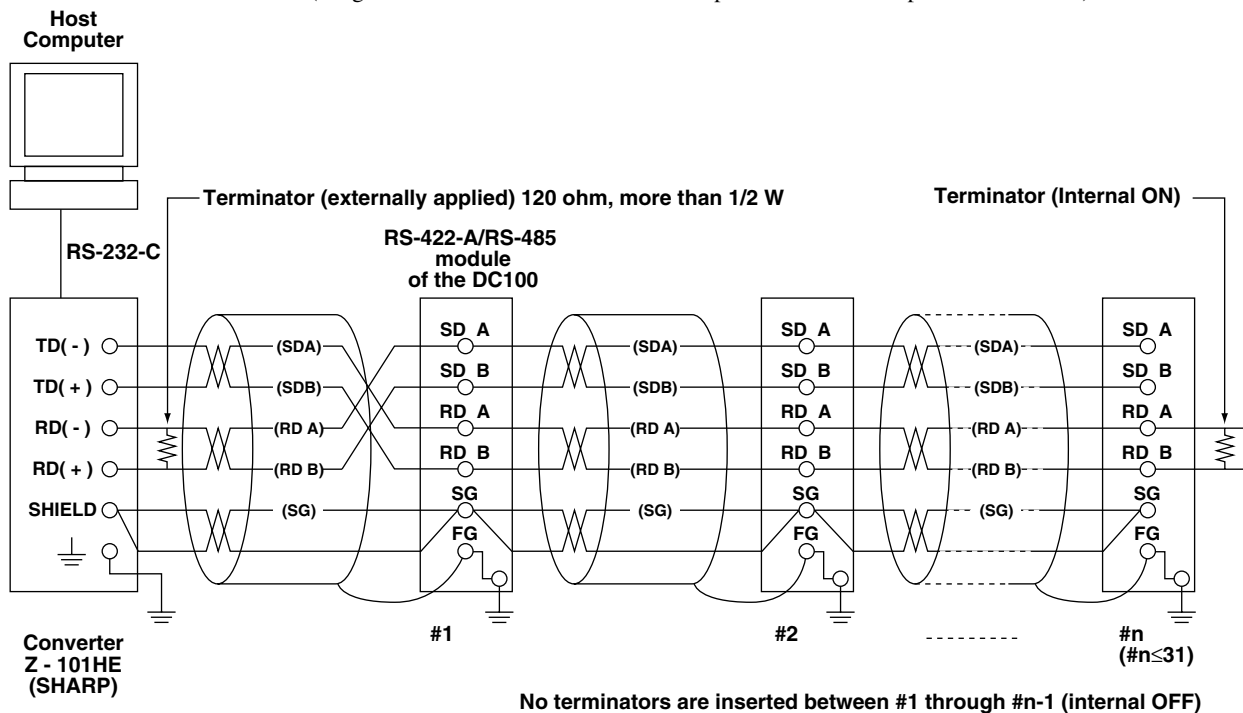
- In the case of RS-232-C, a converter is used as shown in the diagram below.
- For information on recommended converters, refer to “Converters” in the latter.
- Dip switch needs to be changed depending on whether it is a two-wire system or four-wire system. Refer to “3.5 RS-422-A/RS-485 Interface Parameter Setting Procedure.”

#### In the case of four-wire system

In general, the recorder is wired to the host computer using a four-wire system. When four-wire system is used, the send and receive wires need to be crossed.

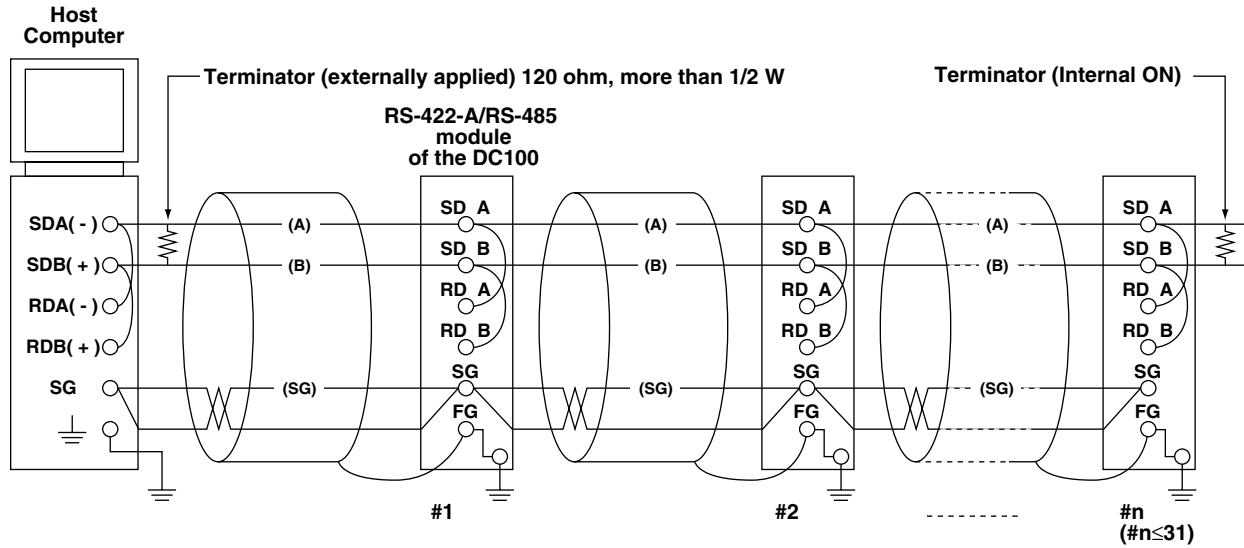


(Diagram below shows the case when the port of the host computer is RS-232-C)



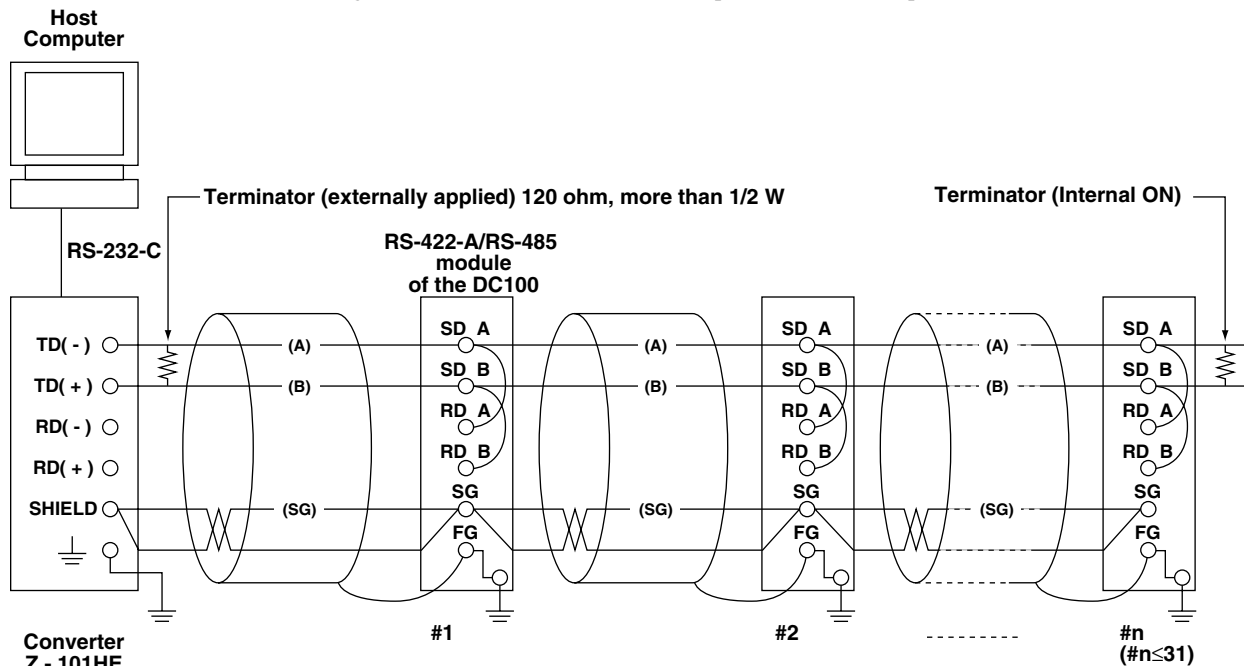
**In the case of two-wire system**

Connect send and receive terminals with the same signal polarity on the terminal arrangement of the RS-422-A/RS-485 module. Only two wires are used in connecting to other units.



No terminators are inserted between #1 through #n-1 (internal OFF)

(Diagram below shows the case when the port of the host computer is RS-232-C)



No terminators are inserted between #1 through #n-1 (internal OFF)

**Note**

- The method in eliminating noise depends on the condition in which it is used. In the example, shielded cable is grounded only at the DC100 (one-sided grounding). This method is effective in eliminating noise in long distance communication in which there is potential difference between the ground of the PC and the ground of the DC100. When there is no potential difference between the ground of the PC and the ground of the DC100, grounding both sides (two-sided grounding) is sometimes effective. In addition, there are cases when grounding both sides with one side having a capacitor connected in series is effective.

Consider all the above cases in eliminating the noise.

#### **Converter**

Recommended converter : Sharp Z-101HE

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#### **CAUTION**

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Some converters other than the recommended, do not have the FG and SG terminals insulated. In such cases, do not connect as in the diagram on the previous page (do not connect anything to the FG and SG terminals of the converter). Especially when it is long distance, the potential difference may damage the devices or the communication may become unreliable.

Also, converters without the SG terminal can be used without grounding. For details, refer to the converter's manual.

---

Some converters other than the recommended have their signal polarity reversed (indication of A/B or +/-). In this case, reverse the connection. If the "RD" LED on the front panel of the RS-422-A/RS-485 module blinks when it receives data, the connection is correct. If it lights, the connection may be reversed.

In the case of the two-wire system, the host computer must control the ON/OFF of the transmission driver of the converter in order to prevent the collision of the send and receive data. When using the recommended converter, ON/OFF is controlled using RTS.

#### **Using the Module with Devices Using the RS-422-A**

Maximum of 31 devices with respect to 1 host computer can be connected with this module, but in a system in which devices using the RS-422-A are used together, this may not be possible.

- In a system in which former Yokogawa recorders are used together  
Some of the former Yokogawa recorders (such as HR2400 and  $\mu$ R) use the RS-422-A driver. In this case, the maximum number of devices that can be connected is 16.

#### **Note**

- 
- According to the RS-422-A standard, the maximum number of devices that can be connected with respect to one port is 10 devices (in the case of a four-wire system).
- 

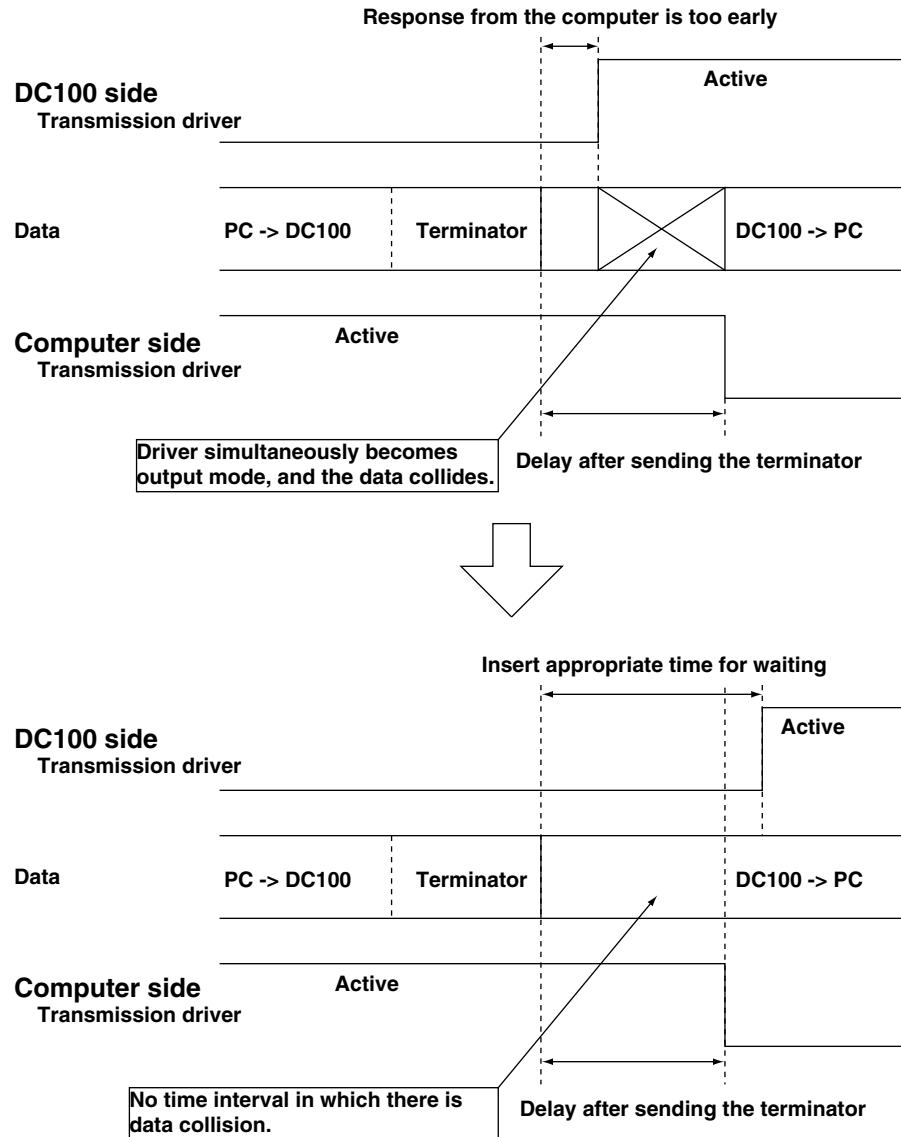
#### **Terminator**

When devices are connected in multi-drop configuration (includes point-to-point connections), turn the terminators of the modules on the extreme ends ON. All modules in between should have them turned off. Terminators are turned ON/OFF using the TERMIN switch on the front panel.

Also, turn ON the terminator on the host computer (refer to the computer's manual). When converters are used, turn their terminators ON also. The recommended converter needs an external terminator to be installed, but some converters are internal types.

### Minimum Response Time

Because send and receive are done on the same line in the two-wire system, minimum response time needs to be set. The minimum response time is the amount of time the RS-422-A/RS-485 module waits in order for the host computer to be able to receive the data after it sends data. The time can be set in the range from 0 to 100 ms. Set the time using the dip switch on the front panel of the RS-422-A/RS-485 module to match the computer or the converter's specification. (Refer to "3.5 RS-422-A/RS-485 Interface Parameter Setting Procedure.") Note that the minimum response time is, as the name indicates, the minimum time for responding. Not all responses will take place in this time. In the four-wire system, the minimum response time does not need to be set (set to 0 ms).



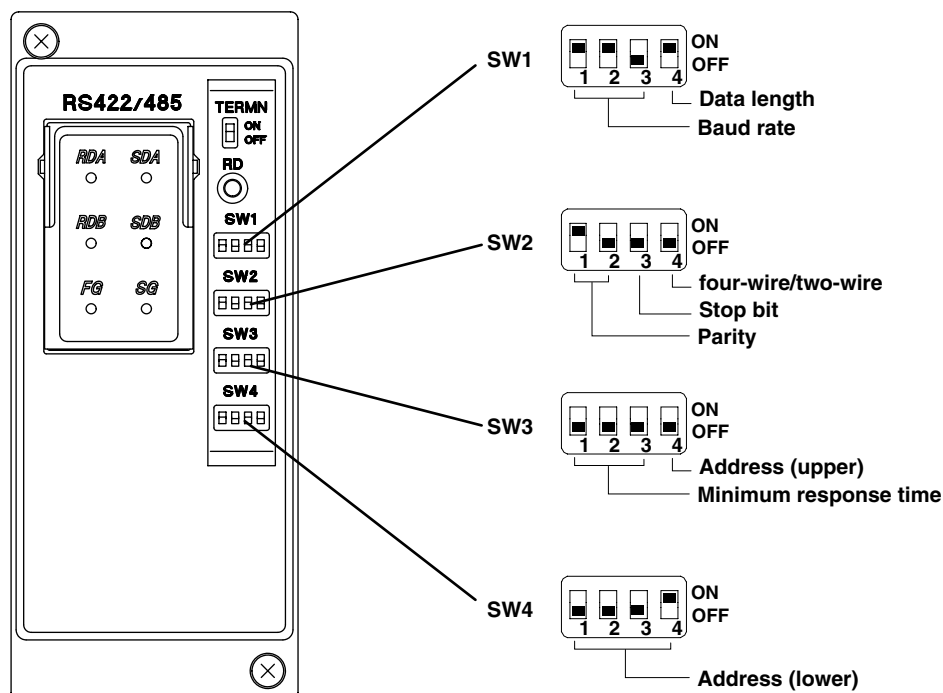
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## **3.4 Communication Data Format**

Same as the RS-232-C interface. For a description, refer to “2.5 Communication Data Format.”

## 3.5 RS-422-A/RS-485 Interface Parameter Setting Procedure

Setting of the RS-422-A/RS-485 parameters must be carried out using the 4 dip switches located next to the module connector.



### Baud rate (No.1 to 3 of SW1)

Baud rate	No.1	No.2	No.3	
300	OFF	OFF	ON	
600	OFF	ON	OFF	
1200	OFF	ON	ON	
2400	ON	OFF	OFF	
4800	ON	OFF	ON	
9600	ON	ON	OFF	←Default Setting
19200	ON	ON	ON	
38400	OFF	OFF	OFF	

### Data length (No.4 of SW1)

Data length	No.4
7	OFF
8	ON ← Default Setting

### Parity (No.1 to 2 of SW2)

Parity	No.1	No.2	
None	OFF	OFF	
ODD	OFF	ON	
EVEN	ON	OFF	← Default Setting

### Stop bit (No.3 of SW2)

Stop bit	No.3
1	OFF ←Default Setting
2	ON

### Switch between four-wire/two-wire systems (No.4 of SW2)

four-wire/two-wire	No.4
four-wire	OFF ←Default Setting
two-wire	ON

### 3.5 RS-422-A/RS-485 Interface Parameter Setting Procedure

#### Minimum response time (No.1 to 3 of SW3)

Minimum response time	No.1	No.2	No.3	
0ms	OFF	OFF	OFF	←Default Setting
10ms	OFF	OFF	ON	
20ms	OFF	ON	OFF	
50ms	OFF	ON	ON	
100ms	ON	OFF	OFF	

#### Address (No.4 of SW3 and No.1 to 4 of SW4)

Address	No.4(SW3)	No.1(SW4)	No.2(SW4)	No.3(SW4)	No.4(SW4)	
1	OFF	OFF	OFF	OFF	ON	←Default Setting
2	OFF	OFF	OFF	ON	OFF	
3	OFF	OFF	OFF	ON	ON	
4	OFF	OFF	ON	OFF	OFF	
5	OFF	OFF	ON	OFF	ON	
6	OFF	OFF	ON	ON	OFF	
7	OFF	OFF	ON	ON	ON	
8	OFF	ON	OFF	OFF	OFF	
9	OFF	ON	OFF	OFF	ON	
10	OFF	ON	OFF	ON	OFF	
11	OFF	ON	OFF	ON	ON	
12	OFF	ON	ON	OFF	OFF	
13	OFF	ON	ON	OFF	ON	
14	OFF	ON	ON	ON	OFF	
15	OFF	ON	ON	ON	ON	
16	ON	OFF	OFF	OFF	OFF	
17	ON	OFF	OFF	OFF	ON	
18	ON	OFF	OFF	ON	OFF	
19	ON	OFF	OFF	ON	ON	
20	ON	OFF	ON	OFF	OFF	
21	ON	OFF	ON	OFF	ON	
22	ON	OFF	ON	ON	OFF	
23	ON	OFF	ON	ON	ON	
24	ON	ON	OFF	OFF	OFF	
25	ON	ON	OFF	OFF	ON	
26	ON	ON	OFF	ON	OFF	
27	ON	ON	OFF	ON	ON	
28	ON	ON	ON	OFF	OFF	
29	ON	ON	ON	OFF	ON	
30	ON	ON	ON	ON	OFF	
31	ON	ON	ON	ON	ON	

## 4.1 Introduction of Functions (Ethernet)

### Connecting to the Network

The Ethernet Module DT300-41 can connect to a network conforming to IEEE802.3 through a 10BASE-T.

By connecting to a network, a PC also connected to the same network will be able to read the data measured by the DC100. However, to do so, the PC must have the following application software installed.

**Data Acquisition Software 32 (DP120 comes with the DC100)**

**Data Acquisition Software 32 Plus (DP320 sold separately)**

These applications are used to set the IP address and other parameters, read in the measured data with the PC, and display various measurement information.

#### Note

- Because the IP address is not set at the time of shipment, an error will occur if you try to communicate without setting the IP address first.

### What You Can Do with the Ethernet module

You can do the following things by using the Ethernet module.

**Read in the DC100 measurement data with the PC, configure and control the DC100 from the PC (supports RS-232-C commands)**

By using the Data Acquisition Software 32 or the Data Acquisition Software 32 Plus, you will be able to read in the DC100 measurement data with the PC and configure and control the DC100 from the PC. This is possible, because the Ethernet module supports all the commands that are supported by the RS-232-C module.

You can also create an original program using the RS-232-C commands.

For details on the commands, see chapter 6.

**Read in instantaneous value data**

You can read in the current measured data with the PC.

**Check the communication conditions**

The following information can be displayed on the computer screen by using Telnet.

- Warning information.
- The socket address and connection state of the DC100 and the PC.
- Information about the network.

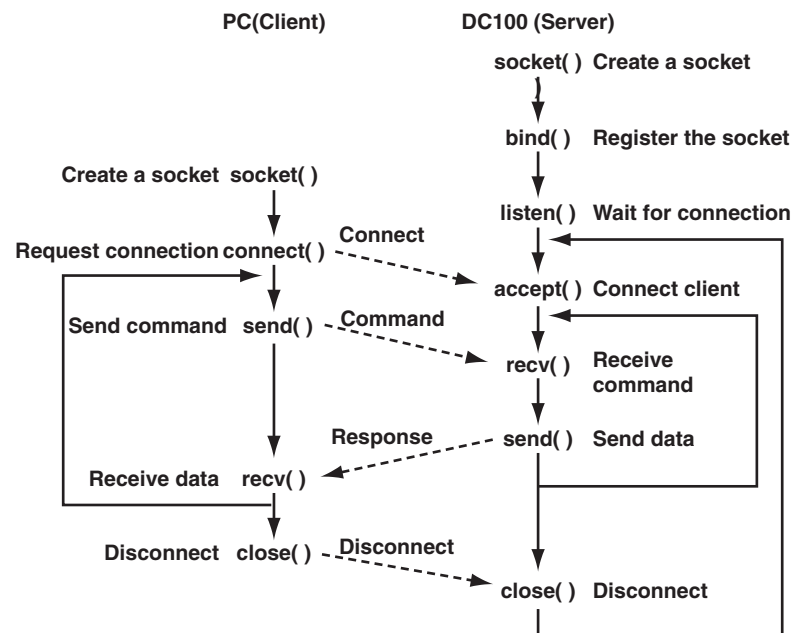
### About the Ports

The Ethernet module uses separate ports for the three functions mentioned above. The number of PCs that can connect (software connections) to each of the ports varies.

Function	Port	Number of Connections
RS-232-C command port	34150	1
Reading instantaneous value data	34151	4
Checking communication conditions	34159	1

## Communication Operation

The flow of the communication is indicated below.



## 4.2 Specifications

### Communication Specifications

Transmission specifications	: 10BASE-T (CSMA/CD, 10Mbps, Baseband)
Electrical/Mechanical specifications:	Conforms to IEEE802.3 (Frames are not supported.)
Protocols	: TCP, IP, UDP, ARP, ICMP

### When supporting RS-232-C commands

Communication format	: TCP/IP
Keepalive	: Turn ON/OFF using dip switch 3. When turned ON, it detects timeouts and disconnects communication
Command data	: ASCII
Response data	: ASCII, BINARY
Receive buffer length	: 200 bytes
Maximum number of connections	: 1
Port No.	: 34150

### When reading in instantaneous value data

Communication format	: TCP/IP
Keepalive	: Turn ON/OFF using dip switch 3. When turned ON, it detects timeouts and disconnects communication
Command data	: ASCII
Response data	: ASCII, BINARY
Receive buffer length	: 200 bytes
Maximum number of connections	: 4
Port No.	: 34151

### When displaying communication conditions

Communication format	: TCP/IP
Command data	: ASCII
Response data	: ASCII
Receive buffer length	: 200 bytes
Maximum number of connections	: 1
Port No.	: 34159

### Protocols

<b>Application layer</b>	<b>DARWIN services</b>
<b>Transport layer</b>	<b>TCP UDP</b>
<b>Network layer</b>	<b>IP ICMP ARP</b>
<b>Data link layer</b>	
<b>Physical layer</b>	<b>Ethernet (10BASE-T)</b>

IP: Internet Protocol

TCP: Transmission Control Protocol

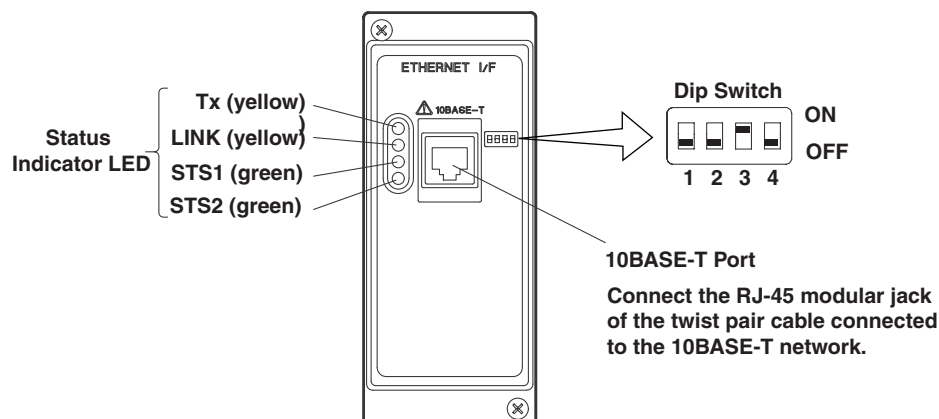
UDP: User Datagram Protocol

ICM: FInternet Control Message Protocol

ARP: Address Resolution Protocol

Part of the software which belongs to the regents of University of California is introduced here.

## 4.3 Names and Functions of Each Section



### Setting the Dip Switch

You can select the following three modes by setting the dip switch.

**Configuration mode:** A mode in which the IP address, subnet mask, and default gateway are set for the DC100.

**Test mode:** A mode in which the condition of the physical connection is tested.

**Communication mode:** A mode in which the DC100 is connected to the network to carry out communication. Use this mode to read in the DC100 measurement data with the PC.

In addition, you can turn ON/OFF the Keepalive function.

Settings are effective only after the DC100 is reboot.

#### Mode Setting

Mode	Switch 1	Switch 2	
Configuration mode	ON	OFF	
Test mode	OFF	ON	
Communication mode	OFF	OFF	← Default setting

Do not set both dip switches, 1 and 2, to ON.

#### Keepalive Setting

Keepalive	Switch 3	
Enable	ON	←Default setting
Disable	OFF	

Keepalive is a function supported by TCP. It sends packets at constant time intervals and automatically disconnects when there is no corresponding response. This instrument sends packets at 30-second time intervals. If a response is not received, it sends 4 more packets at one-second intervals. If a response is still not received, the connection is dropped.

Have dip switch 4 turned OFF.

### LED Indication

The LED indicates the communication conditions and errors of the DC100.

#### Communication condition

LED(color)	Indication	Lit	Not lit	Blinking
Tx(yellow)	Data transmission state	Transmitting	No transmission	-
LINK(yellow)	Connection state (electronically, physically)	Connected	Not connected	-
STS1(green)	Communication mode: connection state	Established	Not established	Error
	Configuration mode: configuration state	Configuration updated	Configuration not updated	Error
	Test mode: test results	No errors	Testing	Error

**Warning**

If the STS2 LED is lit, there is a problem with the communication. You can check the details of the problem by displaying the communication status. (see section 4.8 “Displaying the Communication Information”).

**Error**

An error occurs when the communication fails. When communication error or EEPROM error occurs, the DC100 must be repaired.

STS1, STS2 Indication	Type of Error	Cause
Number of blinks by STS1 is 1 and by STS2 is 1	Configuration error	IP address is not set.
Number of blinks by STS1 is 1 and by STS2 is 2	Communication error	Error occurred while processing TCP/IP.
Number of blinks by STS1 is 2 and by STS2 is 1	EEPROM error	EEPROM malfunction

## 4.4 Setting the IP Address

Before connecting to the network, you will set the IP address, subnet mask, and default gateway of the DC100. There are two methods in setting these parameters.

Configure from the SET menu of the DC100

Configuring from the PC











To configure from the PC, you will need the Data Acquisition Software 32 that came with the DC100 or the Data Acquisition Software 32 Plus that is sold separately.

### ***Configuring from the SET menu of the DC100***

Set the IP address, subnetmask, and default gateway from the SET menu of the DC100. After setting these parameters, the DC100 restarts. Please note that changing these parameters while the measurement is in progress all previous connections are cleared and stops the measurement.

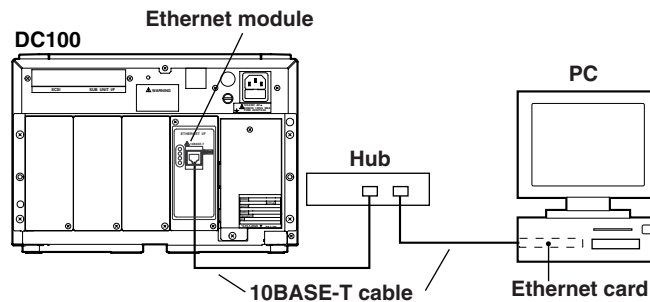
You can set these parameters even if the mode is set to communication mode.

#### **Configuration procedures**

1. Turn ON the DC100 after inserting the Ethernet module into the DC100.
2. Press the "SET" key for about three seconds to go to the SET3 menu.
3. Press either the "" key or the "" key to display "SET=TCP/IP." Pressing the "ENTRY" key displays "IP=XXX.XXX.XXX.XX."
4. Set the IP address. Use the "" and "" keys to select numbers and "" and "" keys to move between digits. Press the "ENTRY" key when you are finished. "SNM=XXX.XXX.XXX.XXX" is displayed.
5. Set the subnet mask. The procedure is the same as setting the IP address. Press the "ENTRY" key when you are finished. "DEF\_GW SET=YES" is displayed.
6. Set whether or not to use the default gateway. Press the "" key or the "" key to select "YES" or "NO," and then press the "ENTRY" key.  
If you select "NO," "TCP/IP=YES" is displayed. Continue to step 8.  
If you select "YES," "DEF\_GW=XXX.XXX.XXX.XXX" is displayed.
7. Set the default gateway. The procedure is the same as setting the IP address. Press the "ENTRY" key when you are finished. "TCP/IP=YES" is displayed.
8. Select whether or not to keep the new configuration. To keep the configuration select "YES." To reconfigure select "NO." Use the "" and "" keys to select "YES" or "NO."  
If you select "YES," the DC100 restarts after you press the "ENTRY" key.  
If you select "NO," "SET=TCP/IP" is displayed after you press the "ENTRY" key. Reconfigure the parameters from step 4.

## Configuring from the PC

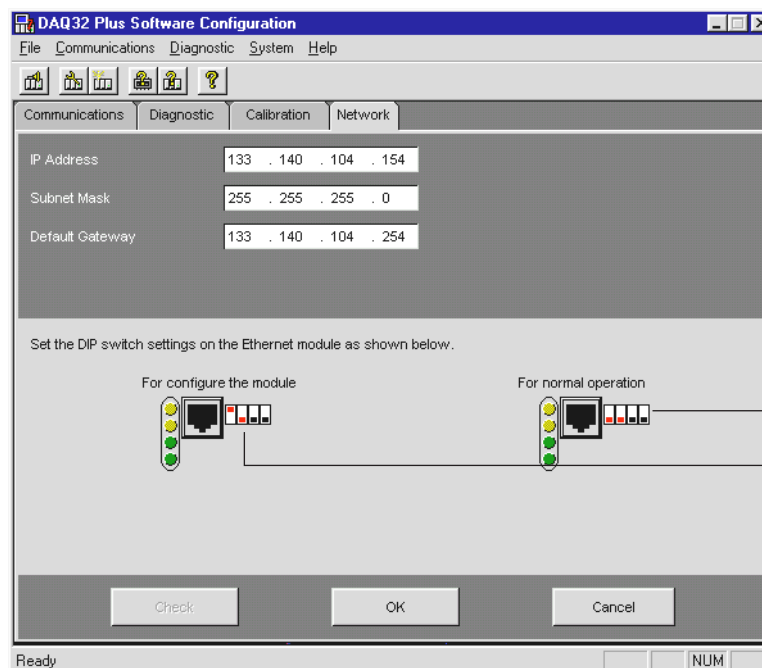
Connect the PC and the DC100 as shown below. The PC must have the Data Acquisition Software 32 or the Data Acquisition Software 32 Plus installed.  
Set the mode of the Ethernet module to configuration mode.



### Setting procedures

Start the Data Acquisition Software 32 (comes with the DC100) or the Data Acquisition Software 32 Plus (sold separately).

1. Switch on power of your PC and the DC100, Startup DAQ 32 and select Software Configurator with the Launcher toolbar.
2. Click the Network tab to display the setting screen for IP address, Subnet Mask, and Default Gateway.

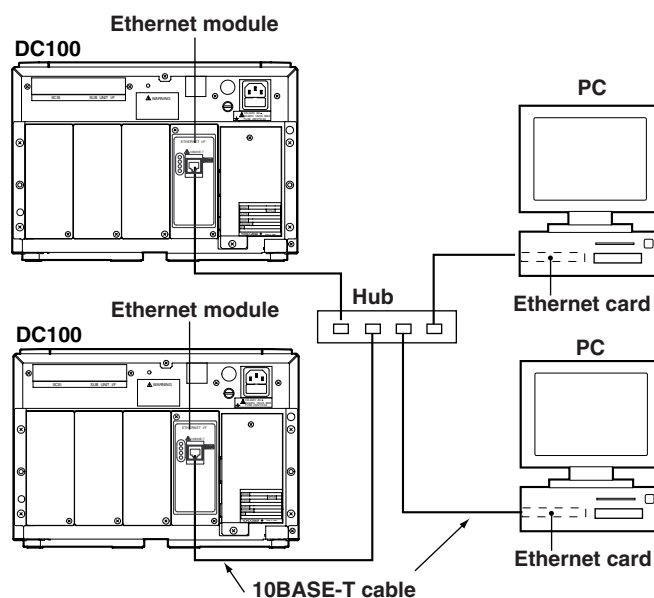


3. Click the Check button to get the currently used settings. If this is the first time you use the DC100, initial values will get displayed.
4. If you click the digits in the IP address, Subnet Mask, or Default Gateway setting boxes, the clicked part will be invertedly displayed, allowing you to change the value.
5. Enter the appropriate setting values for IP address, Subnet Mask, and Default Gateway.
6. After making the settings click OK, and again OK when a reconfirmation message appears, to activate the new network address (IP address, Subnet Mask, and Default Gateway). Click Cancel to return
7. Click OK when asked Close Network? to finish the setting.

## 4.5 Connection Methods

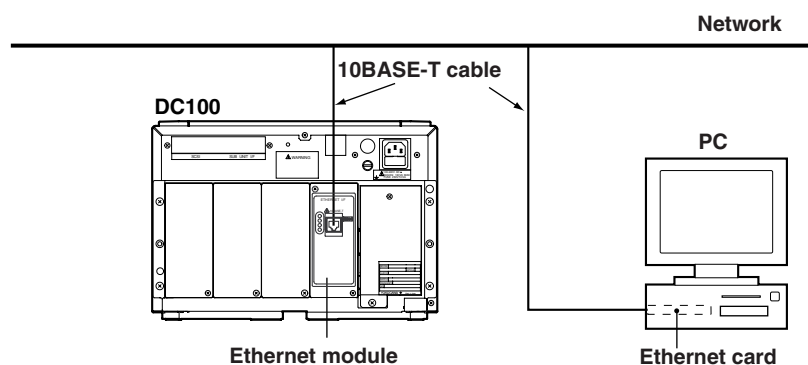
### When Directly Connecting to the PC

If you are directly connecting the DC100 and the PC to read in the measured data, connect them through a hub as follows.



### When Connecting to the Network

An example in which one DC100 and one PC are connected to the network is shown below.



### Note

- Depending on the condition of the network, the PC may not be able to read in all of the measured data.
- You can connect between networks over a router.
- Accessing a DC100 from multiple PCs at once will lower the communication performance.

## 4.6 Checking the Connection (Loopback test)

Automatically tests the condition of the physical connection of the DC100 to the network.

### Mode Setting

Set the dip switch of the Ethernet module to test mode (switch 1: OFF, switch 2: ON).

Functions of the Ethernet module are suspended while in test mode. Therefore, it's necessary to set the dip switch to communication mode after testing.

### Note

- After testing, set the dip switch to communication mode and reboot the DC100.

### Test description

Sends a test packet to the network, and tests whether or not the sent packet can be received.

### Testing

After connecting the DC100 to the network, turn ON the DC100.

The connection test is automatically started.

### Test Results

The test results are indicated by the LED on the Ethernet module.

Normal: STS1 is lit.

Error: STS1 and STS2 blinks alternately.

### If the test result is abnormal

Connect the DC100 and PC through a hub, independent from the network, as described in "Connecting only the DC100 and PC" (page 4-8) and test the connection status again.

If the result is normal: The problem is with the network. Consult your network administrator.

If the result is abnormal: The DC100 must be repaired.

## 4.7 Transferring the Instantaneous Values

The instantaneous values of the data measured on the DC100 (current measured data) are transmitted to the PC that is connected through port No. 34151.

### Note

- Up to four PCs can connect to port No. 34151 of one DC100.
- The commands described here do not affect the status byte.
- EF, EL, and EB command do not support sub-delimiters.

The measured data are transmitted using the following command.

### EF Outputs the measured/computed data in binary format.

Mode	Operation mode
Syntax	EFp1, p2, p3<terminator>
p1	Data to be output <ul style="list-style-type: none"> <li>0 Output only the measured/computed data.</li> <li>1 Output the measured/computed data and alarm data</li> </ul>
p2	First channel to output (001 to 560, or A01 to A60)
p3	Last channel to output (001 to 560, or A01 to A60)
Description	<ul style="list-style-type: none"> <li>• A01 to A60 in p2 and p3 correspond to computation channels (A01 to A30 for the stand-alone type).</li> <li>• The data of expansion type channels that are not connected are not output.</li> <li>• The data are output in the byte order specified by the EB command.</li> <li>• Measured data and computed data are output simultaneously.</li> <li>• If a parameter is omitted, the parameter specified previously is used.</li> <li>• If a specified channel cannot output data, 2-byte data with a data length of zero are output.</li> <li>• The output format is as follows.</li> </ul>

Data length							
Year	Month	Day	Hour	Min	Sec	MS	DM
A1	B1	C1	D1	Measured data			
~~~~~							
Am	Bm	Cm	Dm	Measured data			
E1	F1	G1	H1	Computed data			
~~~~~							
En	Fn	Gn	Hn	Computed data			

Data length: When p1=0: 8 + measurement ch × 4 + computation ch × 6

When p1=1: 8 + measurement ch × 6 + computation ch × 8

MS: Value in units of 0.1 s. 0 or 5.

DM: Dummy (undefined).

A1 to An: Unit number. Computation channel is fixed to 0x80.

B1 to Bn: Measurement channel number

C1 to Cn, G1 to Gn: Alarm status (level 1, 2)

(No output when p1 is 0)

0: No warning

1: Upper limit alarm

2: Lower limit alarm

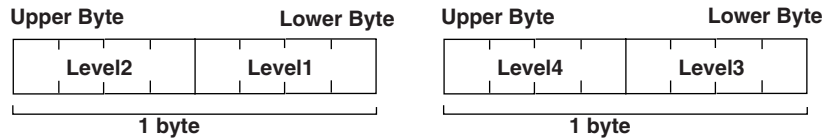
3: Upper difference limit alarm

4: Lower difference limit alarm

5: Rate-of-change upper-limit alarm

6: Rate-of-change lower limit alarm

The alarm status indicates two levels with one byte.



D1 to Dn, H1 to Hn: Alarm status (level 3, 4) (No output when p1 is 0)

Contents and format are the same as level 1 and 2.

E1 to En: Fixed to 80H

F1 to Fn: Computation channel number

The measured/computed data are output in the order specified by the EB command.

Measured data

7FFFH (7FFF7FFFH):	Positive over-limit data
8001H (80018001H):	Negative over-limit data
8002H (80028002H):	Measurement range setting skips.
8004H (80048004H):	Abnormal data
8005H (80058005H):	No data

\*Data inside the parentheses ( ) are computed data.

### **EL Specifies the channel for outputting unit and decimal point information and outputs it in ASCII format**

Mode Operation mode

Syntax ELp1, p2<terminator>

p1 First channel to output (001 to 560, or A01 to A60)

p2 Last channel to output (001 to 560, or A01 to A60)

- Description
- A01 to A60 correspond to computation channels (A01 to A30 for the stand-alone type).
  - The data of expansion type channels that are not connected are not output.
  - If there are no corresponding channels, E1 is returned.
  - The unit and decimal information is not determined if measurement channels are skipped or if abnormal data exist.
  - The output format is as follows.

S1S2CCCuuuuuu, PCrLf

S1: Space (fixed)

S2: Data status

Space Intermediate data

E Last data

CCC: Channel number (3 characters)

001 to 560 or A01 to A60

uuuuuu: Unit(6 characters)

P: Decimal point position

0 00000

1 0000.0

2 000.00

3 00.000

4 0.0000

### **EB Specifies the byte order of output.**

Mode Operation mode

Syntax EBp1<terminator>

p1 Byte order of output

0 MSB first (Default setting)

1 LSB first

- Description
- Sets the byte order of the binary data of the measured/computed data that are output with the EF command.
  - Since the DC100 determines the upper byte and lower byte in units of two bytes, four-byte data are output as follows.

MSB first: ABCD

LSB first: BADC

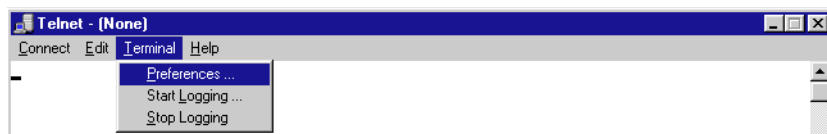
## 4.8 Displaying the Communication Information

The following information can be displayed by using Telnet

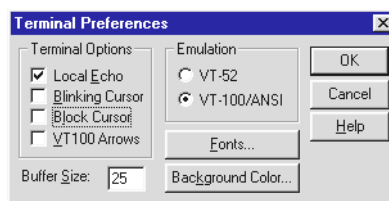
- Warning information
- Connection information
- Network information
- The timeout for the information display application is 15 minutes.

The operating procedures on Windows 95 Telnet are shown below.

1. Set the mode of the Ethernet module to communication mode and connect the DC100 and the PC.
2. Start the Telnet application that comes with Windows 95.
3. Select “Terminal” - “Preferences” from the menu bar.



The following dialog box opens.



4. Set the parameters as shown below and click “OK.”

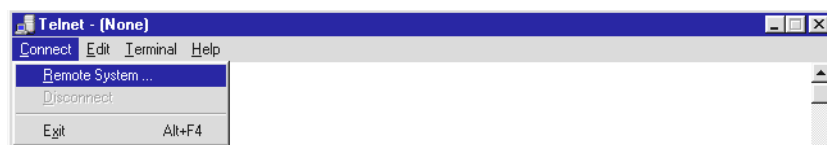
Terminal Options

Local Echo: ON

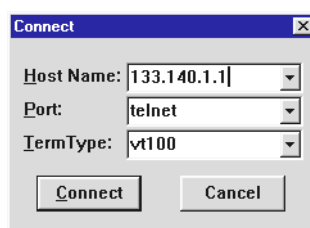
Others : OFF

Emulation: VT-100/ANSI

5. Select “Connect” - “Remote System” from the men bar.



A dialog box for setting the connection destination opens.



6. Set the parameters as shown below and click “Connect.”

Host Name: DC100's IP address

Port: 34159

Term Type: vt100

- wlog: Warning information  
con: Connection information  
net: Network information

If you are using UNIX, follow the directions below.

- Port  
DC100's IP address

```
telnet <Enter>
open 133.140.1.1 34159 <Enter>
```

- The following information is displayed.

total	current	code	END
3	3	1:100	0
		2:100	
		3:300	
		4:0	
		5:0	
		6:0	
		7:0	
		8:0	
		END	

**Warning codes**

- 1: Internal buffer is overflowed
- 2: 16 collision occurred
- 3: Part of EEPROM is invalid

**con**

Active connections

Proto	Local Address	Foreign Address	State
TCP	133. 140. 104. 2:34150	133. 140. 104. 1:1026	ESTABLISHED
TCP	133. 140. 104. 2:34159	133. 140. 104. 1:1024	ESTABLISHED
TCP	0. 0. 0. 0:34159	0. 0. 0. 0:34159	LISTEN
TCP	0. 0. 0. 0:34151	0. 0. 0. 0:34151	LISTEN
TCP	0. 0. 0. 0:34150	0. 0. 0. 0:34150	LISTEN
END			

**Command**

**Connection State**  
ESTABLISHED: Connection established

**Socket address of the connection destination**  
Displayed as "IP address: port address"

**Socket address of the DC100**  
Displayed as "IP address: port address"

**Protocol in use (supports only TCP)**

net	Command
Network Status	
APP: timeout = 15min	Timeout setting (ET command)
APP:34150 timeout = 1	Total number of disconnection on port 34150 due to timeouts
APP:34151 timeout = 1	Total number of disconnection on port 34151 due to timeouts
TCP:keep alive = 1	Keep alive chack cycle
TCP:connects = 5	Total number of times the connection has been established
TCP:closed = 5	Total number of times the connection has been disconnected
TCP:timeoutdrops = 0	Total number of times the connection has been disconnected due to TCP retransmission *1
TCP:keepdrops = 0	Total number of times the connection has been disconnected due to TCP Keepalive timeouts
TCP:sndtotal = 121	Total number of packets *2 transmitted
TCP:sndbyte = 8552	Total number of bytes transmitted
TCP:sndrexitpack = 1	Total number of packets retransmitted
TCP:sndrexitbyte = 209	Total number of bytes retransmitted
TCP:rcvtotal = 150	Total number of packets received
TCP:rcvbyte = 128	Total number of bytes received
DLC:16 collisions = 0	Number of times 16 collision*3 occurred

\*3: Collisions occur when packets collide on the network. Collisions occur more frequently when the network is congested. The condition in which collisions occur 16 times in succession is called 16 collision.

---

## 4.9 Setting the Timeout

A PC connected to the DC100 for a certain period of time is automatically disconnected.

<b>ET</b>	<b>Sets the timeout.</b>
Mode	Operation mode
Syntax	ETp1<terminator>
p1	Timeout time
	0 No timeouts (Default setting).
	1 Disconnect after one minute without any access
	2 Disconnect after 15 minutes without any access
	3 Disconnect after 30 minutes without any access
	4 Disconnect after one hour without any access
	5 Disconnect after two hours without any access
	6 Disconnect after ten hours without any access
Description	<ul style="list-style-type: none"><li>• This command is common to both ports, 34150 and 34151.</li></ul>

---

### Note

- The timeout set with the ET command is used for disconnecting a PC that stays connected for a certain period of time without any operation.
  - KeepAlive is used for disconnecting a connection when the physical connection with the PC is disconnected or the PC goes down.
  - ET command does not support sub-delimiters.
-

## 5.1 Command Format

Commands are configured with ASCII codes and the content is divided into a command, parameters, delimiters and a terminator.

(Example) SR001, VOLT, 20 mV <terminator>

### Command

This is defined with two upper-case letters.

### Parameter

- A delimiter (comma) is used to separate two parameters.
- Numerical values are all set using integers.
- If a parameter is a numeric value, the effective setting range varies with the command.
- Spaces before and after a parameter and embedded spaces in a parameter are ignored. (However, for parameters (unit) specified with ASCII character strings, these spaces are effective.)
- Parameters which do not need to be changed from the current setting can be omitted. However, delimiters cannot be omitted.

(Example) SR001,, 2 V <terminator>

If delimiters continue at the end due to the omission of more than one parameter, they can be omitted.

(Example) SR001, VOLT,,, <terminator> -> SR001, VOLT<terminator>

- The number of digits of the following parameters is fixed. If an erroneous number of digits is input, a syntax error occurs.
  - Date and time
    - Date YY/MM/DD (8 characters)
      - YY: Year (enter the last two digits)
      - MM: Month
      - DD: Day
    - Time HH:MM:SS (8 characters)
      - HH: Hour
      - MM: Minute
      - SS: Second

- Channel number
  - A channel number ..... 3 characters
  - Range of channel numbers ..... 6 characters AAA-BB
  - For details of channel numbers, see page 5-4.

### Note

- If the same setting is to be done for subsequent channels, it can be achieved by connecting channels with a "-" (minus sign). However, channels that can be set subsequently are effective only in the same unit.  
(Example) Setting channels from 1 to 60 in subunit 0 to VOLT, 2 V:  
SR001-60, VOLT, 2V
  - Do not specify the channels of a module which the DC100 has not recognized. Otherwise, an error occurs. Modules that cannot be recognized by the DC100 are those which have been newly added or whose slots have been changed. In order for the DC100 to recognize them, reconstruct the system using the RS command.
  - For specifying subsequent channels, the channels must all be in a module that can be recognized by the DC100.
- Relay number
    - Relay numbers are expressed with 3 characters.
    - For details on the relay numbers, see page 5-4.

### Terminator

Any one of the following forms a terminator.

- CR + LF
- LF
- EOI = True

(If EOI is to be used for a terminator, add EOI = True to the last parameter character.)

### Sub-delimita

Several commands can be executed in a row when they are divided by a semicolon (;).

#### Example

XA2, 2, 0.5 ; XV4 ; XI2, AUTO CrLf

### Note

---

- The total data length from the first character to the terminator should not exceed 200 bytes.
  - A sub-delimita cannot be used for the commands FM, LF, CF, MF, RF, RC, RS, BL, \_M, DS, XE, or XZ. These commands can only be carried out one by one.
  - In case of RS-232-C one ACK-status (E0/E1) will be output for each command divided by ;.
-

## 5.2 Command Syntax

In this manual, each command is explained as shown below.

Command function		
Command		
	<b>SD Set date &amp; time.</b>	
Effective command mode	<b>Mode</b>	Operation mode
Command syntax	<b>Set</b>	SDp1, p2<terminator>
Parameter description		<ul style="list-style-type: none"> <li>p1 year, month, day</li> <li>p2 hour, min., sec.</li> </ul>
Example of setting	<b>Ex.</b>	Set the clock inside the DC100 to July 1, '96, 13:00:00 SD96/07/01, 13:00:00
Explanation of the way to use and remarks in more detail	<b>Comments</b>	<ul style="list-style-type: none"> <li>The formats of p1 and p2 are fixed to 8 characters. Set them in the following manner. p1=YY/MM/DD p2=HH:MM:SS</li> </ul>

### Mode

There are the following three modes in the DC100.

- Operation (measurement) mode  
Mode to perform normal operation (measurement).
- Setup mode  
Mode to set the basic specifications for the DC100.  
To confirm the settings, execute the XESTORE command. See the description for the XE command.
- A/D calibration mode  
Mode to execute calibration of the A/D module.

Each mode is selected by the DS command. For details, see DS Command on page 6-16.

Also in each mode, commands and parameters that can be set and parameters that can be output differ. See the description for each command.

### Number of Channels

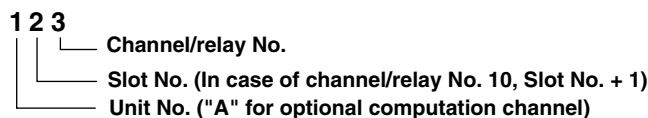
The configurable numbers of measurement and computation channels vary according to the type of DC100, as shown below:

Type of DC100	Highest Measurement-channel Number	Highest Computation-channel Number
Stand-alone model	040	A30
Expandable model	560	A60

## 5.3 Setting a Channel No., and Alarm Output Relay No.

Channel and relay numbers are expressed as shown below in three characters.

Unit No. + Slot No. + Number in slot



### Channel Number

	Stand-alone model	Expandable model
Unit No.	0	0 to 5 (Subunit: DS400/DS600)
Slot No.	0 or 3	0 to 5
Channel No.	1 to 10 (CH10: 0)*	1 to 10 (CH10: 0)*

\*: For CH10, the channel number digit is expressed by 0 and the slot number digit, by slot number + 1.

### Note

- If successive channel numbers are to be specified, enter as ABC-DE, where  
ABC: the above 3-digit channel number (unit no., slot no., and channel no.)  
DE: the channel number except the unit number (slot no., and channel no.)  
Successive channels can only be specified for a unit.
- The input module cannot be mounted to the DC100 main unit.

### Relay Number

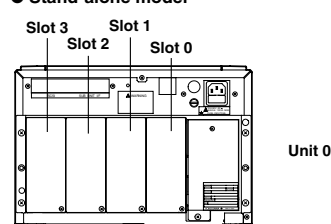
	Stand-alone model	Expandable model
Unit No.	0 S(Internal switch)	I (DC100 main unit) S(Internal switch) 0 to 5 (Subunit: DS400/DS600)
Slot No.	1 to 3	0 to 5
Relay No.	1 to 10 (Relay No. 10: 0)* <sup>2</sup>	1 to 10 (Relay No. 10: 0)* <sup>1</sup>

\*1: For relay No. 10, the channel number digit is expressed by 0 and the slot number digit, by slot number + 1.

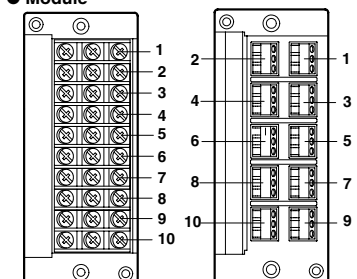
### Example

- Channel 9 of the module mounted in slot 2 of the unit 3 of the expandable model: 329
- Relay of No. 10 of the module mounted in slot 2 of the unit I of the expandable model: I30

#### ● Stand-alone model

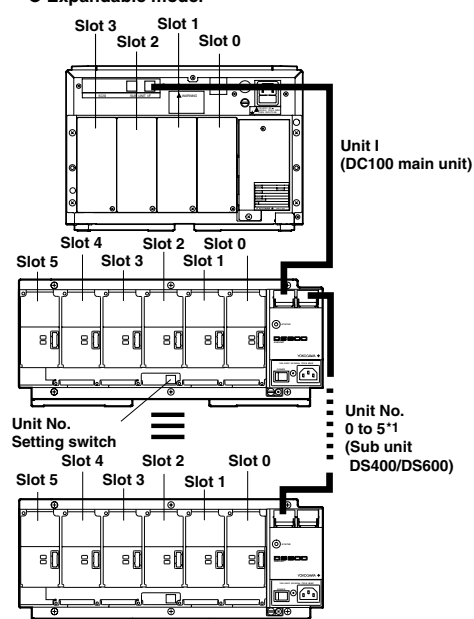


#### ● Module



\*1: The unit number of the sub-unit is the number set by the switch located on each unit below slot 2.  
Make sure the different number is set to each sub-unit in a system.

#### ● Expandable model



## 5.4 Command List

### Setting the Input

Command	Content	Effective mode
SR	Range setting	Operation mode
SN	Unit setting (scale unit)	Operation mode
XV	Sample rate setting	Setup mode
XI	A/D integration time setting	Setup mode
XQ	Filter setting	Setup mode

### Setting Alarms

Command	Content	Effective mode
SA	Alarm setting	Operation mode
XA	Setting related to alarm	Setup mode
XY	Relay reflash setting	Setup mode
XN	Relay AND/OR setting	Setup mode
XD	Relay energizing/deenergizing setting	Setup mode
XH	Relay hold setting	Setup mode

### Setting the Display

Command	Content	Effective mode
UD	Setting the display mode on the upper part of the display	Operation mode
MD	Setting the display mode on the middle part of the display	Operation mode
LD	Setting the display mode on the lower part of the display	Operation mode
XW	Setting the switching time for the displayed channel	Setup mode

### Setting the Way Data Are Saved

Command	Content	Effective mode
MH	Setting of channels through which measured/computed data are written	Operation mode
MW	Setting of method for writing measured/computed data	Operation mode
MX	Setting data to Save (option)	Operation mode
XM	Settings relating to RAM disk on which data are written	Setup mode

### Other Settings

Command	Content	Effective mode
SD	Date and time setting	Operation mode
SV	Moving average setting	Operation mode
SG	Message setting	Operation mode
ST	Tag setting	Operation mode
SY	Copy between channels	Operation mode
SX	Group setting	Operation mode
SI	Timer setting	Operation mode
SQ	Match time setting	Operation mode
SL	Event/action setting	Operation mode
SO	Computation expression setting (option)	Operation mode
SK	Computation constant setting (option)	Operation mode
CM	Setting of input data to be computed (option)	Operation mode
XR	Selection between channel number and tag for display	Setup mode
SW	Setting of summer-winter time	Operation mode

## 5.4 Command List

Command	Content	Effective mode
XK	Key lock setting	Setup mode
XF	Function screen setting	Setup mode
XS	Setting screen setting	Setup mode
XB	Burnout setting	Setup mode
XJ	Reference junction compensation setting	Setup mode
XG	Setting of computation error handling method (option)	Setup mode
YI	Setting SCSI ID number (option)	Setup mode
RO	Setting the hourly, daily and monthly reports and the time to create the report (option)	Setup mode
RM	Setting of the report channel (option)	Setup mode
RI	Setting the print setting which is applied at report creation time	Setup mode
XT	Setting of temperature unit	Setup mode
VL	Setting of language	Setup mode
XE	Setup setting data	Setup mode
_M0	Specifies the file to transfer	Operation mode
CS	Adds a SUM value to the binary data	Operation mode
XZ	Setting for execution, data modification, and data storage in A/D calibration	A/D calibration mode

### Control Execution Command

Command	Content	Effective mode
AK	Acknowledgment of alarm status	Operation mode
AR	Alarm reset	Operation mode
IR	Timer reset	Operation mode
EX	Computation start/stop/reset/clear (option)	Operation mode
BL	Executing the initial balancing	Operation mode
DR	Report start/stop (option)	Operation mode
WS	Start/stop of writing of measured/computed data	Operation mode
WC	Copying of a file of measured/computed data	Operation mode
DW	Writing of one scan's worth of measured/computed data	Operation mode
ME	Deleting a file	Operation mode
MY	Copying a file after converting data to ASCII format	Operation mode
FV	Saving set data on a floppy disk	Operation mode
FL	Reading set data from a floppy disk	Operation mode
FE	Deleting a file on a floppy disk	Operation mode
YV	Saving set data on a floppy disk	Setup mode
YL	Reading set data from a floppy disk	Setup mode
YE	Deleting a file on a floppy disk	Setup mode
RS	System reconstruction	Operation mode
RC	RAM clear (initialization of operation mode)	Operation mode
DS	Setting mode selection	All modes
MI	Clearing Built-in RAM disk	Operation mode

### Output Request Command

Command	Content	Effective mode
TS	Selection of talker output data	All modes
FM	Measured data output request	Operation mode
MF	Request to output measured and report data	Operation mode
RF	Report output request	Operation mode
LF	Setting data output request	All modes
CF	System configuration data output request	All modes
_M1	Request to output the file specified by _M0 comand	Operation mode
BO	Byte output order specification	Operation mode
IM	Interrupt mask specification	Operation mode
SM	Auxiliary mask specification	Operation mode

### Note

- The execution of a command in a mode different from the effective mode will cause a syntax error. Select a mode in which the command is effective using the DS command and do the setting and execution.

## 5.5 Input Range Parameter

### DC Voltage Input

Nominal	Parameter input format	Setting range
20mV	20mV	-20.000 to 20.000mV
60mV	60mV	-60.00 to 60.00mV
200mV	200mV	-200.00 to 200.00mV
2V	2V	-2.0000 to 2.0000V
6V	6V	-6.000 to 6.000V
20V	20V	-20.000 to 20.000V
50V	50V	-50.00 to 50.00V

### Thermocouple

Nominal	Parameter input format	Setting range
R	R	0.0 to 1760.0°C
S	S	0.0 to 1760.0°C
B <sup>*1</sup>	B	0.0 to 1820.0°C
K	K	-200.0 to 1370.0°C
E	E	-200.0 to 800.0°C
J	J	-200.0 to 1100.0°C
T	T	-200.0 to 400.0°C
N	N	0.0 to 1300.0°C
W	W	0.0 to 2315.0°C
L	L	-200.0 to 900.0°C
U	U	-200.0 to 400.0°C
KpAu7Fe	KP	0.0 to 300.0K

\*1: Accuracy compensation range Type-B

### Resistance Temperature Detector (RTD)

Nominal	Parameter input format	Setting range
Pt100: 1mA	PT1	-200.0 to 600.0°C
Pt100: 2mA	PT2	-200.0 to 250.0°C
JPt100: 1mA	JPT1	-200.0 to 550.0°C
JPt100: 2mA	JPT2	-200.0 to 250.0°C
Pt50: 2mA	PT50	-200.0 to 550.0°C
Pt100: 1mA-H	PT1S	-140.00 to 150.00°C
Pt100: 2mA-H	PT2S	-70.00 to 70.00°C
JPt100: 1mA-H	JPT1S	-140.00 to 150.00°C
JPt100: 2mA-H	JPT2S	-70.00 to 70.00°C
Ni100: 1mA-S <sup>*1</sup>	NI1	-200.0 to 250.0°C
No100: 1mA-D <sup>*2</sup>	NI2	-60.0 to 180.0°C
Ni120: 1mA <sup>*3</sup>	NI3	-70.0 to 200.0°C
Cu10: GE <sup>*4</sup>	CU1	-200.0 to 300.0°C
Cu10: L&N	CU2	-200.0 to 300.0°C
Cu10: WEED <sup>*4</sup>	CU3	-200.0 to 300.0°C
Cu10: BAILEY <sup>*4</sup>	CU4	-200.0 to 300.0°C
J263*B	J263B	-0.0 to 300.0K

\*2: RTD (SAMA)

\*3: RTD (DIN)

\*4: RTD (McGRAW EDISON COMPANY)

\*5: RTD (Cuid corresponding to specific manufacturer)

Accuracy compensation range	Cu10:GE -84.4 to 170.0°C
	Cu10:L & N -75.0 to 150.0°C
	Cu10:WEED -20.0 to 250.0°C
	Cu10:BAILEY -20.0 to 250.0°C

## 5.5 Input Range Parameter

### Contact

Nominal	Parameter input format	Setting range
VOLT	LEVL	0 to 1* <sup>1</sup>
CONTACT	CONT	0 to 1* <sup>2</sup>

\*1: Less than 2.4 V → Off (0), 2.4 V or more → On (1)

\*2: Contact On (1), Contact Off (0)

### DC Current Input

Nominal	Parameter input format	Setting range
20mA	20mA	-20.000 to +20.000mA

### Power Monitor

Input range

Nominal	Parameter input format	Setting range
25V-0.5A	25V-0.5A	25VAC, 0.5A
25V-5A	25V-5A	25VAC, 5A
250V-0.5A	250V-0.5A	250VAC, 0.5A
250V-5A	250V-5A	250VAC, 5A

Measuring Range

	25V-0.5A	25V-5A	250V-0.5A	250V-5A
Root mean square voltage Vi (i=1,2,3,13,0)	0.00 to 25.00Vrms	0.00 to 25.00Vrms	0.0 to 250.0Vrms	0.0 to 250.0Vrms
Root mean square current Ii (i=1,2,3,13,0)	0.0000 to 0.5000Arms	0.000 to 5.000Arms	0.0000 to 0.5000Arms	0.000 to 5.000Arms
Active power P1,P2,P3	- 12.50 to 12.50W	- 125.0 to 125.0W	- 125.0 to 125.0W	- 1250 to 1250W
Active power P13	- 25.00 to 25.00W	- 250.0 to 250.0W	- 250.0 to 250.0W	- 2500 to 2500W
Active power P0	- 37.50 to 37.50W	- 375.0 to 375.0W	- 375.0 to 375.0W	- 3750 to 3750W
Apparent power VA1,VA2,VA3	0.00 to 12.50VA	0.0 to 125.0VA	0.0 to 125.0VA	0 to 1250VA
Apparent power VA13	0.00 to 25.00VA	0.0 to 250.0VA	0.0 to 250.0VA	0 to 2500VA
Apparent power VA0	0.00 to 37.50VA	0.0 to 375.0VA	0.0 to 375.0VA	0 to 3750VA
Reactive power Var1,Var2,Var3	0.00 to 12.50Var	0.0 to 125.0Var	0.0 to 125.0Var	0 to 1250Var
Reactive power Var13	0.00 to 25.00Var	0.0 to 250.0Var	0.0 to 250.0Var	0 to 2500Var
Reactive power Var0	0.00 to 37.50Var	0.0 to 375.0Var	0.0 to 375.0Var	0 to 3750Var
Power factor PFi(i=1,2,3,13,0)	- 1.00 to 1.00	- 1.00 to 1.00	- 1.00 to 1.00	- 1.00 to 1.00
Phase angle PHi(i=1,2,3,13,0)	- 80.0 to 80.0deg	- 80.0 to 80.0deg	- 80.0 to 80.0deg	- 80.0 to 80.0deg
Frequency FREQ	45.00 to 65.00Hz	45.00 to 65.00Hz	45.00 to 65.00Hz	45.00 to 65.00Hz

### Strain Input

Nominal	Parameter input format	Setting range
2k	2k	- 2000 to 2000μ $\epsilon$ (1/4 bridge) - 1000 to 1000μ $\epsilon$ (1/2 bridge) - 500 to 500μ $\epsilon$ (full bridge)
20k	20k	- 20000 to 20000μ $\epsilon$ (1/4 bridge) - 10000 to 10000μ $\epsilon$ (1/2 bridge) - 5000 to 5000μ $\epsilon$ (full bridge)
200k	200k	- 200000 to 200000μ $\epsilon$ (1/4 bridge) - 100000 to 100000μ $\epsilon$ (1/2 bridge) - 50000 to 50000μ $\epsilon$ (full bridge)

**Pulse Input**

Nominal	Parameter input format	Setting range
RATE	RATE	0 to 30000
GATE	GATE	0 to 30000

**Measuring Items of Power Monitor**

$V_i$  ( $i=1, 2, 3$ ); Root mean square voltage

$$V13 = (V1+V3)/2$$

$$V0 = (V1+V2+V3)/3$$

$I_i$  ( $i=1, 2, 3$ ); Root mean square current

$$I13 = (I1+I3)/2$$

$$I0 = (I1+I2+I3)/3$$

$P_i$  ( $i=1, 2, 3$ ); Active power

$$P13 = P1+P3$$

$$P0 = P1+P2+P3$$

$Var_i$  ( $i=1, 2, 3$ ); Reactive power

$$Var13 = Var1+Var3$$

$$Var0 = Var1+Var2+Var3$$

$VA_i$  ( $i=1, 2, 3$ ); Apparent power

$$VA13 = VA1+VA3$$

$$VA0 = VA1+VA2+VA3$$

$PF_i$  ( $i=1, 2, 3$ ); Power factor

$$PF13 = P13/(P13^2+Var13^2)^{1/2}=P13/VA13$$

$$PF0 = P0/(P0^2+Var0^2)^{1/2}=P0/VA0$$

$PH_i$  ( $i=1, 2, 3$ ); Phase angle

$$PH13 = \tan^{-1}(Var13/P13)$$

$$PH0 = \tan^{-1}(Var0/P0)$$

FREQ; Frequency

## 5.5 Input Range Parameter

### Single-phase two-wire configuration

CH1	CH2	CH3	CH4	CH5	CH6
P1	VA1	V1	I1	PF1	PH1
				Var1	PF1
				FREQ	V1

Select from these combinations

### Single-phase three-wire/three-phase three-wire configurations (dual-voltage, dual-current; modules for three-phase use only)

CH1	CH2	CH3	CH4	CH5	CH6
P1	VA1	V1	I1	PF1	PH1
P3	VA3	V3	I3	PF3	PH3
P13	VA13			PF13	PH13
				V1	I1
				V3	I3
				V13	I13
				FREQ	V1
				Var1	PF1
				Var3	PF3
				Var13	PF13

Select from these combinations

### Three-phase three-wire configuration (triple-voltage, triple-current; modules for three-phase use only)

CH1	CH2	CH3	CH4	CH5	CH6
P1	VA1	V1	I1	PF1	PH1
P2	VA2	V2	I2	PF2	PH2
P3	VA3	V3	I3	PF3	PH3
P13	VA13			PF13	PH13
				V1	I1
				V2	I2
				V3	I3
				V13	I13
				FREQ	V1
				Var1	PF1
				Var2	PF2
				Var3	PF3
				Var13	PF13

Select from either of the two groups of combinations

V0	I0	V1	I1	V1	I1
V1	I1	V2	I2	V2	I2
V2	I2	V3	I3	V3	I3
V3	I3				

### Three-phase four-wire configuration (modules for three-phase use only)

CH1	CH2	CH3	CH4	CH5	CH6
P0	VA0	V1	I1	PF0	PH0
P1	VA1	V2	I2	PF1	PH1
P2	VA2	V3	I3	PF2	PH2
P3	VA3	P0	VA0	PF3	PH3
		P1	VA1	V1	I1
		P2	VA2	V2	I2
		P3	VA3	V3	I3
				FREQ	V1
				Var0	PF0
				Var1	PF1
				Var2	PF2
				Var3	PF3
				P0	VA0
				P1	VA1
				P2	VA2
				P3	VA3

Select from either of the two groups of combinations

V0	I0	V1	I1	V1	I1
V1	I1	V2	I2	V2	I2
V2	I2	V3	I3	V3	I3
V3	I3				

## 5.6 ASCII Code Table

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0			SP	0		P		p								
1				1	A	Q	a	q							°	
2				2	B	R	b	r							Ω	
3			#	3	C	S	c	s							μ	
4				4	D	T	d	t							ε	
5			%	5	E	U	e	u								
6			&	6	F	V	f	v							ϖ	
7				7	G	W	g	w								
8			(	8	H	X	h	x								
9			)	9	I	Y	i	y								
A	LF		*	:	J	Z	j	z								
B			+	;	K		k									
C					L		l									
D	CR		–		M		m									
E			.		N		n									
F			/		O		o									

Treatment of °

- For measured data output (TS0) or decimal point output (TS2): Space (20H)
- For setting data output (TS1): E1H
- For listener setting: E1H

## 5.7 Default Status

The DC100, when turned on, defaults to the following settings. It resets to the same settings when an RC0, RS0, DS or XE command is issued.

Default Status	Content
TS0	Mode for outputting measured data
IM2	Generation of interruption in case of syntax error
BO0	Output beginning with the most significant byte

## 6.1 Setting the Input

### SR Sets the range.

Mode Operation mode

#### Setting the range to SKIP

Setting SRp1, p2<terminator>  
 p1 Channel number (001 to 560)  
 p2 SKIP  
 Example Skip channel 01 of subunit 0.  
 SR001, SKIP  
 Skip channels 01 to 60 of subunit 0.  
 SR001-60, SKIP  
 Comments • Channel(s) set to SKIP are not measured.

#### Setting voltage, thermocouple, RTD, contact or mA input

Setting SRp1, p2, p3, p4, p5<terminator>  
 p1 Channel number (001 to 560)  
 p2 Type of input  
 VOLT DC voltage  
 TC Thermocouple  
 RTD Resistance temperature detector  
 DI Contact  
 mA DC current(DR232/DR242)  
 p3 Measurement range  
 p4 Span left value  
 p5 Span right value  
 Example Set channel 01 of subunit 1 to the thermocouple type R, and set span left value to 0 °C, span right value to 1760.0 °C.  
 SR101, TC, R, 0, 17600  
 Comments • For the p3 measurement range, see the range parameter table on Pages 5-7 and 5-8.  
 • Set the span in p4 and p5 within the setting range shown on pages 5-7 and 5-8.  
 • For p4 and p5 setting value, enter them within 6 digits excluding the decimal point. The decimal point is fixed. Refer to setting range on pages 5-7 and 5-8.  
 • The measurement range cannot be changed while executing a report or computation, or when a file is written.

#### Setting DELTA(difference between channels)/RRJC(remote RJC)

Setting SRp1, p2, p3, p4, p5<terminator>  
 p1 Channel number (001 to 560)  
 p2 DELTA/RRJC  
 p3 Reference channel (01 to 60)  
 p4 Span left value  
 p5 Span right value  
 Example Set channel 10 of subunit 2 to DELTA that is difference value from channel 01 of the same unit, and set span left value to -100.0, span right value to 100.0.  
 SR210, DELTA, 01, -1000, 1000  
 Comments • As the reference channel, set a channel of the same unit as the channel to be set to DELTA or RRJC. In addition, the reference channel number must be smaller than the source channel number.  
 • For RRJC, input for the reference channel must be of a thermocouple type.  
 • If the input mode (type of input, scaling...) or the measurement range of the reference channel is changed, DELTA or RRJC setting is cleared. The input mode changes to the mode before the reference channel was changed.  
 • If any change has been made to the number, input mode (type of input or scaling), or measuring range

of a given reference channel, the alarm setting of the channel for which the item "DELTA/RRJC" is being set changes to "OFF."

- Set the span in p4 and p5 within the setting range for the reference channel shown on pages 5-7 and 5-8.
- For p4 and p5 setting value, enter them within 6 digits excluding the decimal point. The decimal point is fixed. Refer to setting range on pages 5-7 and 5-8.
- RRJC setup is valid only for the instrument with the optional computing function.
- The measurement range cannot be changed while executing a report or computation, or when a file is written.

#### Setting the power monitor

Setting SRp1, p2, p3, p4, p5, p6, p7<terminator>  
 p1 Channel number(001 to 560)  
 p2 AC  
 p3 Wiring method  
 1Ph2W: Single-phase two-wire system  
 1Ph3W: Single-phase three-wire system (only on a three-wire system)  
 3Ph3W-2I: Three-phase three-wire system (only on a two-voltage two-current three-wire system)  
 3Ph3W-3I: Three-phase three-wire system (only on a three-voltage three-current three-wire system)  
 3Ph4W: Three-phase four-wire system (only on a three-wire system)  
 p4 Input range  
 25 V - 0.5 A  
 25 V - 5 A  
 250 V - 0.5 A  
 250 V - 5 A  
 p5 Measurement item  
 p6 Left value of span  
 p7 Right value of span

Example Set subunit 1 and channel 01 to single-phase two-wire system, input range to 25 V - 0.5 A, measurement item to P1, left value of span to 0, and right value of span to 100.  
 SR101, AC, 1Ph2W, 25V-0.5A, P1, 0, 100

- Comments
- Settings of p3 and p4 are common within one power monitor module. If the setting is changed, the settings on other channels also change.
  - For the measurement item p5, refer to the list of measurement items on page 5-9 and 5-10.
  - If the measurement item p5 is set on channels 1, 3 and 5, channels 2, 4 and 6 are set automatically and cannot be changed. If channels 1, 3 and 5 are set to SKIP, then channels 2, 4 and 6 can be set.
  - There is a limit on what can be set on the measurement item p5 depending on the wiring method and the settings on other channels. If a value outside the limit is set, settings on other channels may change automatically. Set the settings on each channel within the group indicated on page 5-10.
  - Set the span values, p6 and p7, within the measurement range indicated on page 5-8.
  - Input values within 6 digits disregarding the decimal point for p6 and p7. The decimal point position is fixed to the decimal point position of the setting range of page 5-8.
  - The measurement range cannot be changed while executing a report or computation, or when a file is written.

**Setting the strain input**

Setting	SRp1, p2, p3, p4, p5<terminator>
p1	Channel number (001 to 560)
p2	STRAIN
p3	Measurement range 2k/20k/200k
p4	Left value of span
p5	Right value of span
Example	Set the measurement range of subunit 1 and channel 01 to 20k, left value of span to 0, and right value of span to 100. SR101, STRAIN, 20k, 0, 100
Comments	<ul style="list-style-type: none"> <li>Even when the settings of p3 are the same parameters, the measurement range of the strain varies depending on the gauge method. For details, refer to page 5-9.</li> <li>Set spans, p4 and p5, within the measurement range indicated in page 5-9.</li> <li>Input values within 6 digits disregarding the decimal point for p4 and p5.</li> <li>The measurement range cannot be changed while executing a report or computation, or when a file is written.</li> </ul>

**Setting the pulse input**

Setting	SRp1, p2, p3, p4, p5, p6, p7, p8, p9<terminator>
p1	Channel number (001 to 560)
p2	PULSE
p3	Measuring mode RATE momentary pulse count mode GATE contact ON/OFF detection mode
p4	Left value of span (0 to 30000)
p5	Right value of span (0 to 30000)
p6	Left value of scale (0 to 30000)
p7	Right value of scale (0 to 30000)
p8	Decimal point position of scale (0 to 4)
p9	Filter (ON or OFF)
Example	Set subunit 1 and channel 01 to momentary pulse count mode, left value of span to 0, and right value of span to 1000. SR101, PULSE, RATE, 0, 1000, 0, 1000, 0
Comments	<ul style="list-style-type: none"> <li>When omitting p6, p7, or p8, omit all three.</li> <li>When summing the count number or the ON time, set the computational expression with the SO command, then execute computation start with the EX command. When the pulse input module is installed, the use of computation channels become available without the math option. However, the only computational expression available in this case is TLOG.PSUM(XXX) for summing the count number or the ON time.</li> <li>The measurement range cannot be changed while executing a report or computation, or when a file is written.</li> </ul>

**Setting Scaling**

Setting	SRp1, p2, p3, p4, p5, p6, p7, p8, p9<terminator>
p1	Channel number (001 to 560) Computation channel number (A01 to A60)
p2	SCL
p3	Type of input VOLT DC voltage TC Thermocouple RTD Resistance temperature detector DI Contact mA DC current
p4	Measurement range
p5	Left value of span

p6	Right value of span
p7	Left value of scale (-30000 to 30000)
p8	Right value of scale (-30000 to 30000)
p9	Decimal point position of scale (0 to 4)

Example Change channel 02 of subunit 0 to an input in which 1 V is converted to 0.00 and 5 V to 100.00.

SR002, SCL, VOLT, 6V, 1000, 5000, 0, 10000, 2

Comments

- For the p4 measurement range, see the range parameter table on Pages 5-7 and 5-8.
- For the p5 and p6 setting spans, set them in the ranges shown in the setting range on Pages 5-7 and 5-8.
- For p5 and p6 setting values, enter them within 6 digits excluding the decimal point.
- Select either to set all three parameters, p7, p8 and p9, or to omit them all.
- The measurement range cannot be changed while executing a report or computation, or when a file is written.

**Setting the power monitor scaling**

Setting	SRp1, p2, p3, p4, p5, p6, p7, p8, p9, p10, p11<terminator>
p1	Channel number (001 to 560)
p2	SCL
p3	AC
p4	Wiring method 1Ph2W: Single-phase two-wire system 1Ph3W: Single-phase three-wire system (only on a three-wire system) 3Ph3W-2I: Three-phase three-wire system (only on a two-voltage two-current three-wire system) 3Ph3W-3I: Three-phase three-wire system (only on a three-voltage three-current three-wire system) 3Ph4W: three-phase four-wire system (only on a three-wire system)
p5	Input range 25 V - 0.5 A 25 V - 5 A 250 V - 0.5 A 250 V - 5 A
p6	Measurement item
p7	Left value of span
p8	Right value of span
p9	Left value of scale (-30000 to 30000)
p10	Right value of scale (-30000 to 30000)
p11	Decimal point position of scale (0 to 4)
Example	Measure the active power on subunit 0 and channel 01, and convert 10W to 0.00 and 100W to 100.00. SR001, SCL, AC, 3Ph3W-2I, 250V-0.5A, P1, 10, 100, 000, 10000, 2
Comments	<ul style="list-style-type: none"> <li>Settings of p4 and p5 are common within one power monitor module. If the setting is changed, the settings on other channels also change.</li> <li>For the measurement item p6, refer to the list of measurement items on page 5-9 and 5-10.</li> <li>There are items that can not be set on the measurement item, p6, depending on the wiring method or the settings on other channels. Set within the group indicated on page 5-10.</li> <li>Set the span values, p7 and p8, within the measurement range indicated on page 5-8.</li> <li>Input values within 6 digits disregarding the decimal point for p7 and p8. The decimal point position is fixed to the decimal point position of the setting range of page 5-8.</li> <li>For p9, p10, and p11, either set all the three parameters or omit all three.</li> </ul>

- The measurement range cannot be changed while executing a report or computation, or when a file is written.

### Setting the strain input scaling

Setting SRp1, p2, p3, p4, p5, p6, p7, p8, p9<terminator>

p1 Channel number (001 to 560)

p2 SCL

p3 STRAIN

p4 Measurement range  
2k/20k/200k

p5 Left value of span

p6 Right value of span

p7 Left value of scale  
(-30000 to 30000)

p8 Right value of scale  
(-30000 to 30000)

p9 Decimal point position of scale (0 to 4)

Example Measure using the measurement range of 2k for subunit 0 and channel 01, and convert 0μe to 0.00 and 1000μe to 100.00.

SR001, SCL, STRAIN, 2k, 0, 1000, 000, 10000, 2

- Comments
- Even when the settings of p4 are same parameters, the measurement range of the strain varies depending on the gauge method. For details, refer to page 5-8.
  - Set spans p5 and p6 within the measurement range indicated in page 5-8.
  - Input values up to 6 digits disregarding the decimal point for p5 and p6. The decimal point position is fixed to the decimal point position of the setting range of page 5-8.
  - For p7, p9, and p10, either set all the three parameters or omit all three.
  - The measurement range cannot be changed while executing a report or computation, or when a file is written.

### SN Sets the scaling unit.

Mode Operation mode

Setting SNp1, p2<terminator>

p1 Channel number (001 to 560)

Computation channel number (A01 to A60)

p2 Unit character string (up to 6 characters)

Example Set the scaling unit for channel 01 of subunit 0 to ABCDEF.

SN001, ABCDEF

- Comments
- For a character string that can be used as units, see the characters in Section 5.6, "ASCII Code Table." However, note that a semi-colon ";" cannot be used.
  - The optional computation channel number for a stand-alone model is A01 to A30.

### XQ Sets the filter.

Mode Setup mode

Setting XQp1<terminator>

p1 ON Filter on

OFF Filter off

Example Insert a filter in the input.

XQON

### XV Sets the measurement period.

Mode Setup mode

Setting XVp1<terminator>

p1 Measurement interval (0.5, 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, or 60)

Example Set the measurement period to 10 seconds.

XV10

- Comments
- The shortest measurement period that can be set differs depending on the A/D integration time and the filter on/off setting as follows.

Integration time: Equivalent to 50/60 Hz

Input module	Filter off	Filter on
10CH	0.5 s*	3 s
20CH	2 s	4 s
30CH	2 s	4 s

Integration time: 100 ms

Input module	Filter off	Filter on
10CH	4 s	12 s
20CH	5 s	15 s
30CH	6 s	20 s

Integration time: 100 ms

Input module Filter off Filter on

10CH 4 s 12 s

20CH 5 s 15 s

30CH 6 s 20 s

\*: 2s if the power monitor module is installed

### XI Sets the A/D integration time.

Mode Setup mode

Setting XIp1, p2<terminator>

p1 Subunit (0 to 5)

p2 Integration time (AUTO, 50 Hz, 60 Hz, 100 ms)

Example Set the A/D integration time in subunit 0 to 50 Hz.

XI0, 50Hz

## 6.2 Setting Alarms

### SA Sets the alarm.

Mode	Operation mode
Setting	SAp1, p2, p3, p4, p5<terminator>
	p1 Channel number (001 to 560) Computation channel number (A01 to A60)
	p2 Alarm level (1 to 4)
	p3 Type of alarm OFF No alarm setting H High limit alarm L Low limit alarm dH Difference high limit alarm dL Difference low limit alarm RH Rate-of-change limit alarm on increase RL Rate-of-change limit alarm on decrease
	p4 Alarm value
	p5 Output relay number (Off or relay number)
Example	Set the high limit alarm (alarm value=1000) to level 1 of channel 02 of subunit 0 and use relay module 1 in slot 5 of subunit 0 as an output when an alarm is generated. SA002, 1, H, 1000, 051
Comments	<ul style="list-style-type: none"> <li>If the measurement range setting is SKIP, p3 can only be set to OFF.</li> <li>In the following cases, alarm settings in that channel are all canceled. <ul style="list-style-type: none"> <li>Change in the type of input (VOLT, TC .....)</li> <li>Change in the measurement range</li> <li>Change in the indicating span or scaling value when the scaling indication is set (including a change in decimal point position)</li> <li>In differential input or RRJC, a change in reference channel number or type of input/measurement range</li> <li>When the computation channel is set to on or off, or the computational expression or measuring span is changed</li> <li>When the wiring method and the input range of the power monitor module are changed</li> </ul> </li> <li>If contiguous channels are set to p1, the decimal point in alarm values when the measurement ranges for set channels differ take the positions determined for each measurement range (see Pages 5-7 to 5-9). If the result exceeds the measurable ranges, an error occurs. For example, if the channels of measurement ranges 20 mV, 2 V, and type T thermocouple are set to p1 and the alarm value is set to 10000, the following applies: <ul style="list-style-type: none"> <li>The alarm value for the channel of the 20 mV measurement range: 10.000 mV</li> <li>The alarm value for the channel of the 2 V measurement range: 1.0000 V</li> <li>The alarm value for the channel of the type T thermocouple: 1000.0°C</li> <li>Since the measurement range of the type T thermocouple is -200.0 to 400.0°C, an error occurs. For decimal point positions, see Pages 5-7 to 5-9.</li> </ul> </li> <li>If p3 is off, the parameters for p4 and p5 are invalid.</li> <li>The dH or dL setting for p3 is effective only when the input range is a differential input.</li> <li>If p3 is set to RH or RL, set the interval with the XA command.</li> <li>The setting ranges of p4 alarm values are given on Pages 5-7 to 5-9.</li> </ul>

- Set the alarm value for the computation channel within the range of a given span.
- Enter the p4 alarm value with up to 6 characters, excluding the decimal point.  
For computation channels, set the alarm value in no more than 8 digits, excluding the decimal point.
- Setting the output relay number of a module that is not connected to p5 causes an error. For details on how to specify the relay number, see Page 5-4.
- Hysteresis should be set using the XA command. For optional computation channel, the hysteresis is fixed to 0.
- For the computation channel the only alarms, that can be set are the upper limit alarm(H) and lower limit alarm(L).
- The optional computation channel number for a stand-alone model is A01 to A30.

### XA Performs alarm-related settings.

Mode	Setup mode
Setting	XAp1, p2, p3, p4<terminator>
	p1 Interval for rate-of-change limit on increase (1 to 15)
	p2 Interval for rate-of-change limit on decrease (1 to 15)
	p3 Alarm hysteresis (0.0 to 1.0)
	p4 Retention or no retention of alarm display ON/OFF
Example	Set the interval for the rate-of-change limit on increase to 10, the interval for the rate-of-change limit on decrease to 10, and the alarm hysteresis to 0.5% and the alarm display is no retention. XA10, 10, 0.5, OFF
Comments	<ul style="list-style-type: none"> <li>This command sets the interval at which to detect the rate-of-change alarm and hysteresis.</li> <li>Set the interval using the measurement period as the unit.</li> <li>Set the hysteresis as a percentage of the measurement range or scaling range.</li> <li>For optional computation channel, the hysteresis is fixed to 0.</li> </ul>

### XY Sets the re-alarm for a failure which recurs.

Mode	Setup mode
Setting	XYp1, p2<terminator>
	p1 Reflash number (1 to 6)
	p2 Off, relay number
Example	Set reflash relay 1 to relay module 1 connected to slot 0 of unit 1. XY1, 101
Comments	<ul style="list-style-type: none"> <li>Setting the output relay number in a module which is not connected to p2 causes an error. For details on how to specify relay numbers, see Page 5-4.</li> </ul>

### XN Sets AND/OR of the alarm output relay.

Mode	Setup mode
Setting	XNp1, p2<terminator>
	p1 Unit No. 0 to 5
	p2 Relay number to be set to AND (01 to 60) NONE All are OR. 01-XX (XX=01 to 60) Relays whose numbers are 1 to XX are set to AND.

- Example** Use No. 1 of slot 0 to No.10 of slot 2 in the alarm output relay module connected to the main unit as AND relay outputs.  
XNI, 01-30
- Comments**
- The setting is effective only in the same unit.
  - Set p2 with the first relay number (01=fixed) to the last relay number. If all OR outputs are to be set, set p2 to NONE.
  - If a remote or output relay module is not connected to the specified unit, an error occurs.

### **XD Sets energizing or deenergizing.**

- Mode** Setup mode
- Setting** XDp1, p2<terminator>
- p1 Relay number
- p2 Selection of energizing/deenergizing
- ENERG Energizing
- DE-EN Deenergizing
- Example** Set the relays of No. 1 in slot 0 to No. 10 in slot 5 of the relay module connected to subunit 5 to energizing outputs.  
XD501-60, ENERG
- Comments**
- If a successive number of output relays are to be set, insert a minus sign (-) between the first relay number and the last relay number, as shown in the example. However, only relays in the same subunit can be successively set.
  - If a remote or output relay module is not connected to the specified unit, an error occurs.

### **XH Sets the hold/non-hold.**

- Mode** Setup mode
- Setting** XHp1<terminator>
- p1 Output relay hold on/off
- ON Hold
- OFF Non-hold
- Example** Hold the output state of an alarm output relay.  
XHON

## 6.3 Setting the Display

### **UD Changes the display mode on the upper part of the display.**

- Mode** Operation mode
- Setting** UDp1, p2<terminator>
- p1 Display mode
- 0: Auto
- 1: Manual
- 2: Page
- 3: Alarm search
- p2 Display channel number (001 to 560)

**Example** Display in Auto mode.  
UD0

- Comments**
- p2 is effective if p1 is Manual or Page.
  - The display modes are as follows:
    - Auto**  
Displays a channel after automatically selecting a channel.
    - Manual**  
Can freely change the channel to be displayed.
    - Page**  
The channel to be displayed can be changed every five channels. The channel number in p2 cannot be set to numbers other than those whose least significant digit is 1 or 6.
    - Alarm search**  
Displays measured data in the channel in which an alarm occurs in turn.
  - For stand-alone models computation channel number is A01 to A30.

### **MD Changes the display mode on the middle part of the display.**

- Mode** Operation mode
- Setting** MDp1, p2, p3<terminator>
- p1 Display mode
- 0: Auto
- 1: Manual
- 3: Alarm search
- 4: Bargraph
- 5: Alarm status
- 6: Relay status
- 8: File utilization
- 9: Memory utilization
- p2 Display channel number (001 to 560)
- If p1 is the relay status, internal switches (S01 to S60) can be set.
- With optional computation function provided or pulse modules installed, the computation channel (A01 to A60) can be set, if p1 is in the manual mode or alarm status.
- For stand-alone models computation channel number is A01 to A30.
- p3 Display channel number (001 to 560)

**Example** Display the alarm statuses for relay number 2 in slot 1 of subunit 1.  
MD5, 112

- Comments**
- The MD command is ineffective if the display mode for the upper part is "page."
  - If p1 is manual, set a channel to be displayed on the left side of the display with p2 and a channel to be displayed on the right side of the display with p3.
  - P2 is effective when p1 is Manual, Alarm status, or Relay status, but is not effective when the display mode on the upper part is Manual 2.

- p3 is effective when p1 is Manual, but is not effective when the display on the upper part is Manual 2.
- The display modes are as follows:
  - Auto
    - Displays a channel after automatically selecting a channel.
  - Manual
    - Can freely change the channel to be displayed.
  - Alarm search
    - Displays measured data in the channel in which an alarm occurs in turn.
  - Bargraph
    - Displays measured data using a bargraph.
  - Alarm status
    - Displays alarm statuses in up to 30 channels.
  - Relay status
    - Displays statuses of up to 30 alarm output relays.
  - File utilization
    - Without the optional report function
      - Graphically indicates the size of the file already used by splitting the entire file into 40 equal divisions.
    - With the optional report function.
      - Graphically indicates the size of the file already used by splitting the entire file into 8 equal divisions.
  - Memory utilization
    - Graphically indicates the amount of memory already used by splitting the entire memory into 40 equal divisions.

### **LD** Changes the display mode on the lower part of the display.

Mode	Operation mode
Setting	LDp1, p2, p3<terminator>
	p1 Display mode 0: Auto 1: Manual 3: Alarm search 5: Alarm status 6: Relay status 7: Date and time 8: File utilization 9: Memory utilization p2 Display channel number (001 to 560) If p1 is the relay status, internal switches (S01 to S60) can be set. If p1 is in the manual mode or alarm status, and the optional computational functions are provided or if pulse module is installed, the computational channel (A01 to A60) can be set. p3 Display channel number (001 to 560)
Example	Display the measured value of channel numbers 1 and 3 in slot 2 of subunit 2 in manual mode. LD1, 221,223
Comments	<ul style="list-style-type: none"> <li>• The LD command is ineffective if the display mode for the upper part is "page."</li> <li>• If p1 is manual, set a channel to be displayed on the left side of the display with p2 and a channel to be displayed on the right side of the display with p3.</li> <li>• p2 is effective when p1 is Manual, Alarm status or Relay status.</li> <li>• p3 is effective when p1 is Manual.</li> <li>• The display mode is the same as that for the middle part.</li> </ul>

- For stand-alone models computation channel number is A01 to A30.

### **XW** Set the switching time for the displayed channel in auto display.

Mode	Setup mode
Setting	XWp1<terminator>
	p1 Switching time for the displayed channel 2, 3, 4, or 5 (seconds)
Example	Set the display switching time to 5 seconds. XW5
Comments	<ul style="list-style-type: none"> <li>• Sets the display switching time when the display modes at the upper, middle, and lower parts are Auto. This is common to the upper, middle or lower parts.</li> </ul>

## 6.4 Settings Relating to the Way Data Are Saved

### **MH** Sets the channels through which measured/computed data are written.

Mode	Operation mode
Setting	MHp1, p2<terminator>
	p1 Channel number/computation channel number
	p2 On/off
Example	Define computation channels A01 to A05 as the channels to write through. MHA01-05, ON
Comments	• When setting channels in serial order, make sure they are assigned within the same unit.

### **MW** Sets the method for writing measured/computed data.

Mode	Operation mode
Setting	MWp1, p2, p3, p4, p5, p6, p7, p8, p9<terminator>
	p1 Writing action SINGLE: Writes a single file of data. REPEAT: Writes multiple files of data, one at a time, until the RAM disk is full. NONE: Does not write
	p2 Trigger for starting writing FREE: Starts writing when the START key is pressed. TRIG: Starts writing when a trigger takes place.
	p3 Data written ALL: Writes all measured/computed data. ALARM: Writes measured/computed data only in the case of an alarm.
	p4 Method for naming files DATE: Automatically names according to the date. SET: Allows the user to name at the user's discretion.
	p5 File name (5 characters maximum)
	p6 Writing interval INTVL: Writes in synchronization with the measuring interval. 1sec/2sec/3sec/4sec/5sec/6sec/10sec/12sec/15sec/20sec/30sec/1min/2min /3min /4min /5min /10min /30min/60min: Writes at the selected interval. LOGIC: Writes each time the preset event takes place.
	p7 Method for using RAM disk LENGTH: Uses the disk after having specified the channel-by-channel data length. DIV2/ DIV4/ DIV8/ DIV16: Uses the disk after having split the disk into 2, 4, 8 or 16 equal divisions.
	p8 Data length 10 to 100000
	p9 Pre-trigger 0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100
Example	<ul style="list-style-type: none"> <li>• Save one measured data item in a file that is 3k in size after the generation of a trigger. Set the writing interval and pre-trigger at "2min" and "10%," respectively. MWSINGLE, TRIG, ALL, DATE, 2min, LENGTH, 3000, 10</li> <li>• After the generation of a trigger, save one measured data item with a filename of "FILE" in a RAM disk that is split into 2 divisions. Set the writing interval and pre-trigger at "measuring interval" and "50%," respectively. MWSINGLE, TRIG, ALL, SET, FILE, INTVL, DIV2, 50</li> </ul>

- Comments
- If p1 set to NONE, the setting from p2 to p9 are disable.
  - The setting of p1 "NONE" is effective only with optional report function.
  - If p2 is set to FREE, the setting of p9 "pre-trigger" is disabled.
  - If p2 is set to TRIG, the event for the event/action function must be set as MEMRY: WR\_TRIG.
  - If p4 is set to DATE, the setting of p5 "file name" is disabled.
  - If p6 is set to LOGIC, the action for the event/action function must be set as MEMRY: DATA\_WR.
  - AUX, CON, PRN, NUL and CLOCK cannot be used in a file name. Nor are blank spaces allowed to precede the file name.
  - If p7 is set to DIVx, leave p8 "data length" undefined.
  - If the item "pre-trigger" is defined, the DC100 will save data for the specified range before triggering takes place. Set the item as a percentage of the file size. If you set it to 0, the DC100 will not save those data.

### **MX** Sets whether to save the report file or the periodic file.

Mode	Operation mode
Setting	MXp1, p2, p3<terminator>
	p1 NONE Save only the measured/ computed data. MEAS2 Save the measured/computed data and periodic file. REPORT Save the measured/computed data and report data
	p2 Data writing period of the periodic file
	p3 Time corresponding to one periodic file HOUR 1 hour DAY 1 day MONTH 1 month
Example	Save one hour of the measured data in one-minute intervals as periodic files. MX MEAS2, 1min, HOUR
Comments	<ul style="list-style-type: none"> <li>• p2 and p3 are effective only when p1 is set to MEAS2.</li> <li>• This command is effective only with the optional report functions.</li> </ul>

### **XM** Sets parameters relating to the RAMdisk.

Mode	Setup mode
Setting	XMp1, p2, p3, p4, p5, p6<terminator>
	p1 Alarm time for measured/computed file making 0h: Raises an alarm at the end of measured/ computed file making. 1h/2h/3h/4h/5h: Raises an alarm when the measured/computed file reaches its specified capacity in terms of the timeframe.
	p2 Overwriting a file with the same name On: Overwrites. Off: Does not overwrite.
	p3 Continuation of saving On: Continues saving after deleting the oldest file if there isn't enough space in RAM disk. However, it stops saving when the space can't be ensured after deleting 5 of the oldest files. Off: Stops saving.
	p4 File deletion after copying On: Deletes the file. Off: Does not delete the file.
	p5 Copy lock NOT: Does not apply. USE: Applies.
	p6 Password in copy locking (0-9999)

**Example** Set the item “alarm time for file making” to one hour, and then the rest of the items, except the item “password when locking copied files,” in order of the desired options, as shown below.  
XM1h, ON, OFF, ON, NOT

## 6.5 Other Settings

### **SD** Sets the date and time.

**Mode** Operation mode  
**Setting** SDp1, p2<terminator>  
     p1 Date (year, month, day)  
     p2 Time (hour, minute, second)  
**Example** Set the clock in the DC100 to 1 o'clock pm, (0 min., 0 sec.) on July 1, 1996.  
 SD96/07/01, 13:00:00  
**Comments**

- The formats for p1 and p2 are fixed at 8 characters. Set them in the following manner:  
 p1 = YY/MM/DD (Last two digits of the year, month, day)  
 p2 = HH:MM:SS (Hour:minute:second)
- Do not place space(s) before and after, or embed them in the parameter. Otherwise, an error occurs.

### **SV** Sets a moving average.

**Mode** Operation mode  
**Setting** SVp1, p2<terminator>  
     p1 Channel number (001 to 560)  
     p2 Number of moving averages (0 to 64)  
         0 = Off  
**Example** Take moving averages 64 times in the input of subunit 0, channel 01.  
 SV001, 64

### **SG** Sets or copies a message. **Message setting**

**Mode** Operation mode  
**Setting** SGp1, p2<terminator>  
     p1 Message number (01 to 20)  
     p2 Message character string (Up to 16 characters)  
**Example** Set the message “test” to message No. 5.  
 SG05, test  
**Comments**

- For details of the character strings that can be used in messages, see the characters in the table of ASCII codes on Page 5-11. However, note that a semi-colon “;” cannot be used.

#### **Message copy**

**Mode** Operation mode  
**Setting** SGp1, p2, p3<terminator>  
     p1 COPY  
     p2 Message number at a message source (01 to 20)  
     p3 Message number at a message destination (01 to 20)  
**Example** Copy message No. 5 to message No. 12.  
 SGCOPY, 05, 12

### **ST** Sets a tag.

**Mode** Operation mode  
**Setting** STp1, p2<terminator>  
     p1 Channel number (001 to 560)  
         Computation channel number (A01 to A60)  
     p2 Tag character string (up to 8 characters)  
**Example** Set “TEST” as the tag for channel 6 in slot 3 of subunit 4.  
 ST436, TEST  
**Comments**

- For details of the character strings that can be used as tags, see the characters in the table of ASCII codes on Page 5-11. However, note that a semi-colon “;” cannot be used.
- The optional computation channel number for a stand-alone model is A01 to A30.

**SY Sets how to copy the channel setting parameters between channels.**

Mode	Operation mode
Setting	SYp1, p2, p3, p4, p5-p6<terminator>
p1	Copy range parameters including unit (ON, OFF)
p2	Copy alarm parameters (ON, OFF)
p3	Copy the other parameters (ON, OFF)
p4	Copy source channel numbers (001 to 560) Computation channel number (A01 to A60)
p5	First channel number of copy destination (001 to 560) Computation channel number (A01 to A60)
p6	Last channel number of copy destination (01 to 60)
Example	Copy only the range setting data in channel 01 of subunit 0, to channel 01 to channel 60 of subunit 1. SYON, OFF, OFF, 001, 101-60 Copy only the range setting data in channel 02 of subunit 0, to channel 03 of subunit 0. SYON, OFF, OFF, 002, 003
Comments	<ul style="list-style-type: none"> <li>If the copy command is to be applied to successive channels, insert a minus sign (-) between the first channel number and the last channel number. However, only channels in the same subunit can be set successively.</li> <li>The optional computation channel number for a stand-alone model is A01 to A30.</li> <li>No copying is possible between measurement and computation channels.</li> </ul>

**SX Sets channels in a group.**

Mode	Operation mode
Setting	SXp1, p2<terminator>
p1	Group number (G01 to G07)
p2	Channel number (up to 36 characters)
Example	Set channels from channel 1 in slot 1 of unit 4 to channel 10 in slot 3 of subunit 4 and channel 5 in slot 4 of unit 4 to group 3. SXG03, 411-440, 445
Comments	<ul style="list-style-type: none"> <li>This command is effective only with the optional computation functions.</li> <li>Delimit the channels set in p2 with a comma (.). For successive channels, insert a "-" (minus) between the first and last channels.</li> </ul>

**SI Sets the timer.**

Mode	Operation mode
Setting	SXp1, p2, p3, p4<terminator>
p1	Timer number (1 to 6)
p2	ABSOLUTE: Absolute time RELATIVE: Relative time
p3	Time interval <b>For ABSOLUTE</b> 1 min, 2 min, 3 min, 4 min, 5 min, 6 min, 10 min, 12 min, 15 min, 20 min, 30 min, 1 h, 2 h, 3 h, 4 h, 6 h, 8 h, 12 h, 24 h <b>For RELATIVE,</b> Fixed to 8 characters DD HH:MM DD: Day HH: Hour MM: Minute
p4	Reference time (fixed to 5 characters) HH:MM HH: Hour MM: Minute

Example	Set timer No. 3 to intervals of 15 minutes each starting at 15:15. SI3, ABSOLUTE, 15 min, 15:15
Comments	<ul style="list-style-type: none"> <li>p4 is effective when p2 is ABSOLUTE.</li> <li>In ABSOLUTE, the time interval set with p3 is used from the time set with p4.</li> <li>In RELATIVE, the time interval set with p3 is used from the time when the timer setting is completed, the power is turned on, or the set timer is executed.</li> </ul>

**SQ Sets a match time.**

Mode	Operation mode
Setting	SQp1, p2<terminator>
p1	Match time number (1 to 3)
p2	Time (fixed to 8 characters) DD HH:MM (day hour:minute)
Example	Set a match time 1 at 12:00 on the 15th day. SQ1, 15 12:00
Comments	<ul style="list-style-type: none"> <li>When the time set here is reached, the operation set for the match time is executed.</li> </ul>

**SL Sets an event/action.**

Mode	Operation mode
Setting	SLp1, p2<terminator>
p1	event/action box number (01 to 30)
p2	NONE

**Release of event/action setting****Event action setting by an alarm, manual function key or file end event**

Setting	SLp1, p2, p3, p4, p5<terminator>
p1	Event action box number (01 to 30)
p2	Event (ALARM, MFUNC_KEY, FILE_END)
p3	Action mode (EDGE, LEVL)
p4	Action
	ALARM_ACK Acknowledgement of alarm status.
	ALARM_RST Alarm reset
	TIMER_RST Timer reset
	MSG_DISP Display message
	MEMRY Store measured/computed data on a RAM disk or copy a file to a floppy disk.
	FLOPY Read setup data from a floppy to DC.
	MATH Computation start/stop/reset/clear, group reset.
	REPORT Report start/stop
	SCSI0 to SCSI7: Read setup data from a SCSI device
	FLAG: Set flag to 1
p5	Auxiliary action information (for p3=EDGE)
	• For p4=MSG_DISP, message number (01 to 20)
	• For p4=MEMRY
	DATA_WR When the data writing interval is LOGIC, measured/computed data are stored at every measurement for each event action.
	WR_TRIG A trigger for starting the writing of measured/computed data
	START Starts the writing of measured/computed data.
	PAUSE Stops or restarts the writing of measured/computed data.
	CP_FDD Copies to a floppy disk.
	CP_SCS0 to CP_SCS7 Copies to SCSI device.

	<ul style="list-style-type: none"> <li>• For p4=FLOPY or SCSI0 to SCSI7</li> </ul>
LD_TRG1	Setting data are read.
LD_TRG2	Setting data are read.
LD_TRG3	Setting data are read.
	<ul style="list-style-type: none"> <li>• For p4=MATH</li> </ul>
START	Computation starts.
STOP	Computation stops.
RESET	Computed data are reset.
CLEAR	Computed data are cleared.
RST_G01 to RST_G07:	Computed data in the specified group are cleared.
	<ul style="list-style-type: none"> <li>• For p4=REPORT</li> </ul>
START	Report starts.
STOP	Report stops.
	<ul style="list-style-type: none"> <li>• For p4=FLAG</li> </ul>
F01 to F16:	Specified flag number is set to 1.
Auxiliary action information (for p3 = LEVL)	
	<ul style="list-style-type: none"> <li>• For p4=MEMRY</li> </ul>
PAUSE	Stops or restarts the writing of measured/computed data.
	<ul style="list-style-type: none"> <li>• For p4=FLAG</li> </ul>
F01 to F16:	Specified flag number is set to 1.

#### Event function setting by a remote, relay, timer or match time event

Setting	SLp1, p2, p3, p4, p5, p6<terminator>
p1	Event action box number (01 to 30)
p2	Event (REMOTE, RELAY, TIMER, MATCH_TIME)
p3	Auxiliary action information
	<ul style="list-style-type: none"> <li>• For p2=REMOTE, contact number (1 to 12)</li> <li>• For p2=RELAY, relay number</li> <li>• For p2=TIMER, timer number (1 to 6)</li> <li>• For p2=MATCH_TIME, match time number (1 to 3)</li> </ul>
p4	Action mode (EDGE, LEVL)
p5	Action
	ALARM_ACK Acknowledgement of alarm status.
	ALARM_RST Alarm reset
	TIMER_RST Timer reset
	MSG_DISP Display message
	MEMRY Store measured/computed data on a RAM disk or copy a file to a floppy disk.
	FLOPY Read setup data from a floppy disk to DC.
	MATH Computation start/stop/reset/clear, group reset.
	REPORT Report start/stop
	SCSI0 to SCSI7: Read setup data from a SCSI device
	FLAG: Set flag to 1
p6	Auxiliary action information (for p4=EDGE)
	<ul style="list-style-type: none"> <li>• For p5=MSG_DISP, message number (01 to 20)</li> <li>• For p5=MEMRY</li> </ul>
	DATA_WR When the data writing interval is LOGIC, measured/computed data are stored at every measurement for each event action.

WR_TRIG	A trigger for starting the writing of measured/computed data
START	Starts the writing of measured/computed data.
PAUSE	Stops or restarts the writing of measured/computed data.
CP_FDD	Copies to a floppy disk.
CP_SCS0 to CP_SCS7	Copies to SCSI device.
	<ul style="list-style-type: none"> <li>• For p5=FLOPY or SCSI0 to SCSI7</li> </ul>
LD_TRG1	Setting data are read.
LD_TRG2	Setting data are read.
LD_TRG3	Setting data are read.
	<ul style="list-style-type: none"> <li>• For p5=MATH</li> </ul>
START	Computation starts.
STOP	Computation stops.
RESET	Computed data are reset.
CLEAR	Computed data are cleared.
RST_G01 to RST_G07:	Computed data in the specified group are cleared.
	<ul style="list-style-type: none"> <li>• For p5=REPORT</li> </ul>
START	Report starts.
STOP	Report stops.
	<ul style="list-style-type: none"> <li>• For p5=FLAG</li> </ul>
F01 to F16:	Specified flag number is set to 1.

Auxiliary action information (for p4=LEVL)

	<ul style="list-style-type: none"> <li>• For p5=MEMRY</li> </ul>
PAUSE:	Stops or restarts the writing of measured/computed data.
	<ul style="list-style-type: none"> <li>• For p5=FLAG</li> </ul>
F01 to F16:	Specified flag number is set to 1.

Example Set an event action to display message number 04 when the file ends in event action box 02.

SL02, FILE\_END, EDGE, MSG\_DISP, 04

- Comments
- With an action as the start (event), another action (action) can be executed automatically.
  - Thirty types of event actions can be set.
  - If the action mode is EDGE, the set action continues even if the event action is over.
  - If the action mode is set to LEVL and the action is set to MATH, REPORT or FLAG the set action continues from the first event occurrence to the next event occurrence.
  - If “event” is set to ALARM, REMOTE or RELAY, “action mode” to LEVL, and “action” to PAUSE, the DC100 stops writing measured data for as long as the event continues. When the event ends, it restarts writing.
  - If the event is set to TIMER, MFUNC\_KEY or MATCH\_TIME, the action mode to LEVL, and the action to PAUSE, the DC100 alternates between stopping and restarting the writing of measured data each time an event occurs.
  - For details on an event/action, see the separate manual (IMDC100-01E).

**SO Sets the computational expression.**

Mode	Operation mode
Setting	SOp1, p2, p3, p4, p5, p6<terminator>
	p1 Channel for computation: Stand-alone model - A01 to A30 Expandable model - A01 to A60
	p2 Computation on/off (on/off)
	p3 Computational expression (up to 40 characters)
	p4 Span left value (-9999999 to 99999999)
	p5 Span right value (-9999999 to 99999999)
	p6 Position of decimal point for span (0 to 4)
Example 1	Set the sum of channel numbers 001 and 002 to channel A01 for computation. Set -10.0000 to 15.0000 for the span. SOA01, ON, 001+002, -100000, 150000, 4
Example 2	Set the data in channel number 003, which are stored in the built-in RAM disk to channel number A02 for computation. Set -100,000 to 150,000 for the span. SOA02, ON, M003, -100000, 150000, 3
Comments	<ul style="list-style-type: none"> <li>This command is effective only with optional computation functions or installed a pulse module.</li> <li>Without computation functions, you cannot use operators. For operators, see the Appendix at the end of this manual.</li> <li>When omitting p4, p5, or p6, omit all three.</li> <li>If successive channels are set, place a "-" (hyphen) between the first and last channels.</li> </ul>

**SK Sets the computational constants.**

Mode	Operation mode
Setting	SKp1, p2 <terminator>
	p1 Computational constant number: Stand-alone model - K01 to K30 Expandable model - K01 to K60
	p2 Constants
Example	Set 300 to a computational constant K10. SKK10, 300
Comments	<ul style="list-style-type: none"> <li>This command is effective only with the optional computation functions.</li> <li>Constant setting ranges are -1.0000E35 to -1.0000E-35, 0, 1.0000E-35 to 1.0000E35.</li> </ul>

**CM Sets communication input data.**

Mode	Operation mode
Setting	CMp1, p2 <terminator>
	p1 Communication input data number: Stand-alone model — C01 to C30 Expandable model — C01 to C60
	P2 Numeric value: -32000 to 32000
Example	Set 300 to the communication input data number C10. CMC10, 300
Comments	<ul style="list-style-type: none"> <li>This command is effective only with the optional computation functions.</li> <li>The position of the decimal point is selected according to the position of the decimal point set for the span with SO command. So you can set communications input data without taking the decimal point into consideration.</li> </ul>

**RO Setting hourly/daily/monthly report to ON/OFF and the time to create the report**

Mode	Setup mode
Setting	ROp1, p2, p3, p4<terminator>
	p1 ON Create hourly report OFF Hourly report OFF
	p2 ON1 Create daily report in standard format ON2 Create daily report in extended format OFF Daily report OFF
	p3 ON1 Create monthly report in standard format ON2 Create monthly report in extended format OFF Monthly report OFF
	p4 Date and time to create the report DD HH DD: Date HH: Hour
Example	Do not create hourly reports and create daily and monthly reports in standard format. Create the monthly report at 10 O'clock on the first day of every month and the daily report at 10 O'clock everyday. ROOFF, ON1, ON1, 01 10
Comments	<ul style="list-style-type: none"> <li>Effective only on instruments with the optional report function.</li> <li>The report is output using TS4+device trigger (GET)+RF.</li> <li>Date is set between 01 and 28 and hour is set between 00 and 23 for p4.</li> <li>Items p2 and p3 cannot both be set to ON2 at the same time.</li> </ul>

**RM Setting report channel to ON/OFF and the report computation type**

Mode	Setup mode
Setting	RMp1, p2, p3, p4, p5<terminator>
	p1 Report channel number (R01 to R60)
	p2 Set the report channel to ON/OFF.
	p3 Corresponding channel number Measurement channel: 001 to 060 for stand-alone model, 001 to 560 for expandable model Computation channel: A01 to A30 for stand-alone model, A01 to A60 for expandable model
	p4 The type of computation INST Instantaneous value at the time when the report is created. AVE Average value SUM Summed value
	p5 Conversion of the standard unit of time INTVL No conversion /sec Convert as the summed value of the physical amount every second /min Convert as the summed value of the physical amount every minute /hour Convert as the summed value of the physical amount every hour /day Convert as the summed value of the physical amount everyday
Example	Set the summed value of the measurement channel 005 which is measuring the amount of flow in units of l/min to the report channel, R02. RMR02, ON, 005, SUM, /min
Comments	<ul style="list-style-type: none"> <li>Effective only on instruments with the optional report function.</li> <li>If average value (AVE) is set on p4, minimum and maximum values are also computed along with the average value.</li> </ul>

- If SUM is set on p4, the following computations are carried out along with the summed value from the time when the report was created to the next report.  
For hourly report: Total of the summed values up to the time the daily report is created.  
For daily report: Total of the summed values up to the time the monthly report is created  
Only summed value for monthly report
- The settings p3, p4 and p5 are effective when p2 is ON.
- The setting p5 is effective only when p4 is set to SUM.
- Since the sum is computed every measurement interval using the sampled data, there are cases when the physical amount per unit amount of time is measured, the computed result differs from the actual summed value (the measurement interval and the unit time are different). In this case, set the same unit used for the unit time of the physical amount being measured to p5. The summed values are computed using the following converting equations depending on the parameters.  

$$\text{INTVL} \sum (\text{measured values})$$

$$\text{/sec} \quad \sum (\text{measured values}) \times \text{measurement interval}$$

$$\text{/min} \quad \sum (\text{measured values}) \times \text{measurement interval} / 60$$

$$\text{/hour} \quad \sum (\text{measured values}) \times \text{measurement interval} / 3600$$

$$\text{/day} \quad \sum (\text{measured values}) \times \text{measurement interval} / 86400$$

The unit of the measurement interval is seconds.

**SW Set the summer-winter time**

Mode	Operation mode
Setting	SWp1,p2<terminator>
	p1 Summer time or Winter time
	SUMMER Summer time
	WINTER Winter time
	p2 Changing time
Example	Change to summer time at 12 o'clock on June 15th, 1996 SWSUMMER,96/06/15 12

**XR Selects between the channel number and tag for display.**

Mode	Setup mode
Setting	XRp1<terminator>
	p1 Selection between the channel number and tag for display
	CHANNEL: channel number
	TAG: tag
Example	Use tags to distinguish between measured values. XRTAG

**XK Sets the key lock.**

Mode	Setup mode
Setting	XKp1, p2, p3, p4, p5, p6, p7, p8<terminator>
	p1 USE Uses the key lock.
	NOTDoes not use the key lock.
	p2 START key (LOCK, FREE)
	p3 STOP key (LOCK, FREE)
	p4 CLOCK key (LOCK, FREE)
	p5 FUNC key (LOCK, FREE)
	p6 FD COPY key (LOCK, FREE)
	p7 M.FUNC key (LOCK, FREE)
	p8 Password number (0 to 9999)
Example	Lock the START, STOP, CLOCK keys and set the password number to 123. XKUSE, LOCK, LOCK, LOCK, FREE, FREE, FREE, 123

**XF Sets the function to be displayed on the function screen.**

Mode	Setup mode
Setting	XFp1, p2<terminator>
	p1 Content to be displayed on the function screen.
	ALARM_ACK Acknowledgment of current alarm status
	ALARM_RESET Alarm is reset.
	TIMER_RESET Timer is reset.
	KEY_LOCK_ON Key lock is turned on.
	MATH_START Starts computation.
	MATH_CLR_START Clears computation results then re-start computation.
	MATH_STOP Stops computation.
	MATH_ACK Clears the computation status indication.
	REPORT_START Starts report.
	REPORT_STOP Stops report.
	KEY_LOCK_OFF Key lock is turned off.
	RAM_INIT Internal memory is initialized.
	COMM_INF Information on communication module parameter
	MODULE_INF Module information
	RE_SYSTEM Reconstruction of a system
	DATA_WRITE Writing of one scan's worth of measured/computed data
	ALL_ITEM All items of parameter p1
	p2 Type of screen
	OFF No display on the function screen
	FUNC1 Screen that appears when the FUNC key is pressed.
	FUNC3 Screen that appears when the FUNC key is pressed for 3 seconds.
	INIT Initialize. (Effective only when p1 is set to ALL_ITEM.)
Example	Display key lock on the FUNC1 screen. XFKEY_LOCK_ON, FUNC1
Comments	<ul style="list-style-type: none"> <li>• More than one function can be displayed on each function screen.</li> <li>• A function can be easily executed by being displayed on the function screen.</li> </ul>

**XS Sets which settings are to be displayed on the setting screen.**

Mode	Setup mode
Setting	XSp1, p2<terminator>
	p1 Contents to be displayed on the set screen
	UNIT Unit settings
	MATH Settings for computation of respective computation channels
	CONST Settings for computation constants

	MEDIA	Settings relating to data saving/reading on floppy disks
	TAG	Tag settings
	TIMER	Timer settings
	LOGIC	Logic settings
	MESSAGE	Message settings
	GROUP	Group settings
	MOVE_AVE	Moving average settings
	MATCH_TIME	Match time settings
	CH_COPY	Copy contents settings between channels
	DST	Summer/winter time
	ALL_ITEM	All items of parameter p1
p2	Type of screen	
	OFF	Nothing appears on the set screen.
	SET	Screen when the set key is pressed
	SET3	Screen when the set key is pressed for 3 seconds
	INIT	Initialize. (Effective only when p1 is set to ALL_ITEM.)
Example	Show the settings of a tag on the screen for which you have pressed the SET key. XSTAG, SET	
Comments	<ul style="list-style-type: none"> <li>More than one setting item can be displayed on the set screen.</li> <li>By displaying a setting item on the set screen, the setting item can be easily set.</li> <li>MATH and CONST in parameter p1 are valid only for the instrument with the optional computing function.</li> </ul>	

**XB Sets the burnout.**

Mode	Setup mode
Setting	XBp1, p2<terminator>
	p1 Channel number (001 to 560)
	p2 Selection of burnout
	OFF
	UP Upscale traveling beyond the scale
	DOWN Downscale traveling beyond the scale
Example	Set channels 01 to 10 of subunit 0 to upscale burnout. XB001-10, UP
Comments	<ul style="list-style-type: none"> <li>If channels are to be set successively, the setting is effective only when the channels are in the same unit.</li> </ul>

**XJ Selection of reference junction compensation**

Mode	Setup mode
Setting	XJp1, p2, p3<terminator>
	p1 Channel number (001 to 560)
	p2 Selection of reference junction compensation value
	INT Internal compensation circuit
	EXT External junction compensation
	p3 External reference junction compensation value (-20000 to 20000)
Example	Set channel 01 of subunit 0 to external junction compensation at a compensation value of 1000 $\mu$ V XJ001, EXT, 1000
Comments	<ul style="list-style-type: none"> <li>For p2 = INT, parameter p3 is ineffective.</li> <li>The unit of p3 is <math>\mu</math>V.</li> </ul>

**YI Sets the SCSI ID Number.**

Mode	Setup mode
Setting	YIp1<terminator>
	p1 SCSI ID number (0 to 7)
Example	Set the SCSI ID number to 1. YI1
Comments	<ul style="list-style-type: none"> <li>Assign the ID so that it does not overlap with other connected SCSI devices.</li> </ul>

**XG Sets computation error handling.**

Mode	Operation mode
Setting	XGp1, p2, p3, p4, p5<terminator>
	p1 Computation error handling (+OVER/-OVER)
	p2 Scale unit for TLOG computation (OFF, /SEC, /MIN, /HOUR)
	p3 Handling of abnormal data in a channel for TLOG computation
	ERROR Handled as computation error.
	SKIP Abnormal data are skipped (ignored) and computations are executed.
	p4 Handling of overflow data in a channel for TLOG computation
	ERROR Handled as computation error.
	SKIP Abnormal data are skipped (ignored) and computations are executed
	LIMIT If linear scaling has been set, its upper- and lower-limit values are computed. If it has not been set, the upper- and lower-limit values in the measurement range are computed.
	p5 handling of data for TLOG.PSUM(only for PULSE input module)
	OVER A result of the computational expression TLOG.PSUM (XXX) exceeding 99999999 as an overflow
	ROTATE A result of the computational expression TLOG.PSUM (XXXX) exceeding 99999999 to continue computing with the value following 99999999 reset to 0.

Example Compute computation error as +OVER and TLOG computation scale value as off, and ignore abnormal data in a channel and overflow data in a channel for computation and a result of the computational expression TLOG.PSUM (XXX) exceeding 99999999 as an overflow. .

XG+OVER, OFF, SKIP, SKIP, OVER

Comments

- This command is effective only with the optional computation functions.
- p2 is effective for the totalization of flow signals, which are expressed in engineering units — /s, /min, /h.

If p2 is set according to the input unit, the measurement data are computed based on that unit at the specified measurement intervals. For example, set the measurement interval to 2s, the input value to 100 m<sup>3</sup>/min, and p2 to /MIN. By doing this, because 2s/60s is multiplied for each measurement interval, then after 1 minute, approximate actual input values are obtained.

**XT Sets the temperature unit**

Mode Setup mode  
 Setting XTp1<terminator>  
     p1 Temperature unit  
         C °C  
         F °F  
 Example Set temperature unit to °C  
 XTC

**XL Sets the language**

Mode Setup mode  
 Setting XLp1<terminator>  
     p1 Language  
         ENGLISH  
         GERMAN  
         FRENCH  
 Example Set the language to GERMAN  
 XTGERMAN

**XE Establishes the contents of the setup mode setting.**

Mode Setup mode  
 Setting XEp1<terminator>  
     p1 Selection of establishment or destruction  
         STORE Establishment  
         ABORT Destruction  
 Example Store a parameter set in the setup mode in NVRAM.  
 XESTORE  
 Comments • A parameter set in the setup mode becomes ineffective if the mode is changed without executing STORE. After setting all parameters in the setup mode, you must store the set data in the internal memory using the XE command. After normal processing with the XE command, the mode is transferred to the operation mode.  
 • Since execution of the XE command takes an indefinite time, return an ACK after the processing is completed. On the controller side, execute the next processing after receiving an ACK after transmitting the XE command. The format of the ACK status is as follows:  
 E0Cr+Lf The processing of a received command completed normally.  
 E1Cr+Lf There is an error in the received command.

**M0 Specifies the file to transfer.**

Mode Operation mode  
 Setting \_M0, p1, p2, p3<terminator>  
     p1 0 Open the file  
       1 Close the file  
     p2 File name  
         8 characters + extension (3 characters)  
     p3 Output block size  
         0 256 bytes  
         1 512 bytes  
         2 1024 bytes  
         3 2048 bytes  
 Example Transfer the data from the file, test1.DAT, in 512-byte block sizes.  
 \_M0, 0, test1 DAT, 1  
 Comments • The data are output after the data output request by the \_M1 command. The data size is the block size specified by p3.  
 • Specify the file name with eight characters. If it is less than eight characters, enter spaces to make it eight characters long.

- The \_M0 command is invalid for the following cases.
  - Another \_M0 command is issued.
  - When the DC100 is turned OFF.
  - When the specified file is erased.
- You cannot omit the parameters.
- When the \_M0 command is sent, the number of blocks (obtained by dividing the data file specified by p2 by the block size specified by p3) and the number of bytes in the last block are returned in the following format.

Column	1	2	3	4	5	6	7	8	9	10	11	12	13
ASCII	0	0	3	4	5	6	,	0	1	2	8	0x0d	0x0a
	Number of blocks (0 to 999999)						Number of bytes in the last block					CrLf	

If 1 is specified for p1 or the specified file does not exist, then columns 1 to 6 and columns 8 to 11 are returned with all zeroes.

- After outputting the data from the opened file, make sure to close the file with the \_M0 command.

**CS Adds a SUM value to the binary data.**

Mode Operation mode  
 Setting CSp1<terminator>  
     p1 0 Do not add a SUM value to the binary data  
       1 Add a SUM value to the binary data  
 Example Output the binary data with the SUM value.  
 CS1  
 Comments • The SUM value is two bytes of the same value that is obtained by subtracting the lower two digits of the sum of the data length and the data bytes from PFH. It can be used to test the validity of the data that are output.

Without the SUM value

0A	00	01	02	03	04	05	06	07	08	09	0A	0x0d	0x0a
Data length				Data							CrLf		

With the SUM value

0C	00	01	02	03	04	05	06	07	08	09	0A	BC	BC	0x0d	0x0a
Data length				Data							SUM value		CrLf		

- You can add the SUM value to binary outputs other than those of the MF and RF commands. Do not add SUM values to the MF and RF commands. The data will not be output properly.
- Send the CSO command after every data output.
- The initial setting is not to output the SUM value. The setting returns to the initial setting when the DC100 is turned OFF.

**XZ Performs A/D calibration of the input module.**

Mode A/D calibration mode

**Calibration using the actual input value at the input terminal**

Setting XZp1, p2, p3, p4<terminator>  
     p1 Subunit number (0 to 5)  
     p2 Slot number (0 to 5)  
     p3 CAL/EXEC  
     p4 Calibration item  
 For a universal input module:  
 20 mV, 60 mV, 200 mV, 2 V, 6 V, 20 V, 50 V,  
 pt:1 mA, Pt:2 mA, Pt:1 mA-H, Pt:2 mA-H,  
 Cu:2 mA  
 For a DCV/TC/DI input module:

20 mV, 60 mV, 200 mV, 2 V, 6 V, 20 V, 50 V  
 For a mA-input module:  
 20 mA  
 For a strain input module:  
 2k\_ZERO, 2k\_SPAN, 20k\_ZERO,  
 20k\_SPAN, 200k\_ZERO, 200k\_SPAN, INIT  
 For a digital-input module:  
 60mV, 6V

**Example** Calibrate the 20-mV range on the module in slot 1 of subunit 0.

XZ0, 1, CAL/EXEC, 20mV

- Comments**
- For DCV/TC/DI input modules, it is not possible to calibrate any RTD.
  - When calibrating the DC voltage range, apply the rated value of the voltage being calibrated to channel 3 of the module and short-circuit channel 2.
  - When calibrating an RTD, apply a 100-Ω input to channel 5 and short-circuit channel 4.
  - When calibrating a highly sensitive RTD, first calibrate it at the 60-mV and 200-mV ranges. This strategy enables the RTD to be calibrated more precisely.
  - When calibrating a mA-input module, apply the 20-mA range being calibrated to channel 3 of the module and short-circuit channel 2.
  - If an INIT option is applied to a strain input module, the DC100 initializes all the preadjusted setpoints of the module (including “unopened” setpoints). After the use of the INIT option, always readjust all of the ranges (zero/span adjustment of the ‘2k,’ ‘20k’ and ‘200k’ ranges).
  - Always calibrate a strain input module in the order of zero and span adjustments.

### Correcting the calibration value manually (universal module)

**Setting** XZp1, p2, p3, ..... , p25<terminator>

p1 Unit number (0 to 5)  
 p2 Slot number (0 to 5)  
 p3 DISPLAY  
 p4 Zero calibration value for 20-mV range  
 p5 Span calibration value for 20-mV range  
 p6 Zero calibration value for 60-mV range  
 p7 Span calibration value for 60-mV range  
 p8 Zero calibration value for 200-mV range  
 p9 Span calibration value for 200-mV range  
 p10 Zero calibration value for 2-V range  
 p11 Span calibration value for 2-V range  
 p12 Zero calibration value for 6-V range  
 p13 Span calibration value for 6-V range  
 p14 Zero calibration value for 20-V range  
 p15 Span calibration value for 20-V range  
 p16 Zero calibration value for 50-V range  
 p17 Span calibration value for 50-V range  
 p18 Zero calibration value for Pt:1 mA  
 p19 Span calibration value for Pt:1 mA  
 p20 Zero calibration value for Pt:2 mA  
 p21 Span calibration value for Pt:2 mA  
 p22 Span calibration value for Pt:1 mA-H  
 p23 Span calibration value for Pt:2 mA-H  
 p24 Zero calibration value for Cu:2 mA  
 p25 Span calibration value for Cu:2 mA

### Correcting the calibration value manually (DCV/TC/DI input module)

**Setting** XZp1, p2.....p17<terminator>

p1 Unit number (0 to 5)  
 p2 Slot number (0 to 5)  
 p3 DISPLAY  
 p4 Zero calibration value for 20-mV range  
 p5 Span calibration value for 20-mV range  
 p6 Zero calibration value for 60-mV range  
 p7 Span calibration value for 60-mV range  
 p8 Zero calibration value for 200-mV range  
 p9 Span calibration value for 200-mV range  
 p10 Zero calibration value for 2-V range  
 p11 Span calibration value for 2-V range  
 p12 Zero calibration value for 6-V range  
 p13 Span calibration value for 6-V range  
 p14 Zero calibration value for 20-V range  
 p15 Span calibration value for 20-V range  
 p16 Zero calibration value for 50-V range  
 p17 Span calibration value for 50-V range

### Correcting the calibration value manually (mA input module)

**Setting** XZp1, p2, p3, p4, p5<terminator>

p1 Unit number (0 to 5)  
 p2 Slot number (0 to 5)  
 p3 DISPLAY  
 p4 Zero calibration value for 20-mA range  
 p5 Span calibration value for 20-mA range

### Correcting the calibration value manually (Strain input module)

**Setting** XZp1, p2, p3, ..... , p9<terminator>

p1 Unit number (0 to 5)  
 p2 Slot number (0 to 5)  
 p3 DISPLAY  
 p4 Zero calibration value for 2k range  
 p5 Span calibration value for 2k range  
 p6 Zero calibration value for 20k range  
 p7 Span calibration value for 20k range  
 p8 Zero calibration value for 200k range  
 p9 Span calibration value for 200k range

**Example** Modify the span calibration value for the 60-mV range of the module in slot 1 of subunit 0 to 32000.  
 XZ0, 1, DISPLAY, , , , 32000

### Correcting the calibration value manually (Digital input module)

**Setting** XZp1, p2, p3, p4, p5, p6, p7<terminator>

p1 Unit number (0 to 5)  
 p2 Slot number (0 to 5)  
 p3 DISPLAY  
 p4 Zero calibration value for 60mV range  
 p5 Span calibration value for 60mV range  
 p6 Zero calibration value for 6V range  
 p7 Span calibration value for 6V range

**Example** Modify the span calibration value for the 6V range of the module in slot 1 of subunit 0 to 32000.  
 XZ0, 1, DISPLAY, , , , 32000

**Storage of A/D calibration data in a module (A/D calibration END processing)**

Setting XZp1,p2,p3,p4,p5,p6,p7

Setting XZp1, p2, p3, p4&lt;terminator&gt;

p1 Unit number (0 to 5)

p2 Slot number (0 to 5)

p3 END

p4 Storage selection (ABORT, STORE)

Example Store the calibrated values for the module in slot 1 of subunit 0.

XZ0, 1, END, STORE

- Comments
- If the calibrated setpoints of a DCV/TC/DI input module is corrected manually, items relating to RTD's become meaningless.
  - When calibrating a highly sensitive RTD, first calibrate it at the 60-mV and 200-mV ranges. This strategy enables the RTD to be calibrated more precisely.
  - You must execute STORE using A/D calibration end processing each time after making an A/D calibration or adjustment for one module. If A/D calibration end processing (STORE) is not executed, the calibrated data will not take effect.
  - Since it takes an indefinite time to execute the XZ command, return an ACK after the processing ends.
  - On the controller side, execute the following processing after receiving an ACK after transmitting the XZ command. The format of the ACK status is as follows:  
 E0Cr+Lf The received command was normally processed.  
 E1Cr+Lf There is an error in the received command.
  - If A/D calibration data are adjusted, inputting a numeric value which is out of the setting range disables the modules to be recognized. For details, see the separate manual (IM DC100-01E).

## 6.6 Control and Execution Command

**AK Confirms the current alarm status.**

Mode Operation mode

Setting AKp1&lt;terminator&gt;

p1 0 Confirms the current alarm status.

Example Confirm the current alarm status.  
AK0**AR Resets an alarm.**

Mode Operation mode

Setting ARp1&lt;terminator&gt;

p1 0 The alarm is reset.

Example Reset the alarm.  
AR0**IR Resets the timer.**

Mode Operation mode

Setting IRp1&lt;terminator&gt;

p1 0 The timer is reset.

Example Reset the timer.  
IR0**EX Computation start/stop, restart of computed data after they are cleared, and release of statuses after completing measurement.**

Mode Operation mode

Setting EXp1&lt;terminator&gt;

p1 Computation start/stop, restart of computed data after they are cleared, and execution of releasing statuses after completing measurement.

0: Computation start

1: Computation stop

2: Restart of computed data after they are cleared

3: Computed data clear

4: Release of statuses after completing measurement

Example Start the computation.  
EX0

- Comments
- This command is effective only with the optional computation functions or with a pulse module installed.
  - If MATH is set for level action in the event/action, a computation start/stop/start after clearing the computed data cannot be done using EX command.
  - This command is not executable during the saving/reading of setup data.

**WS Starts/stops the writing of measured/computed data, report data and periodic file.**

Mode Operation mode

Setting WSp1&lt;terminator&gt;

p1 0: Start

1: Stop

2: Pause

Example Start writing.  
WS0

**WC**      **Copies a file of measured/computed data, report data and periodic file.**

Mode      Operation mode  
 Setting    WCp1, p2<terminator>  
             p1      Copy mode  
                     ALL:      Copies all files.  
                     SELECT: Copies a selected measured/  
    computed data file or periodic file  
    only.  
                     REPORT: Copies a selected report file only.  
             p2      File name (8 characters maximum)  
             p3      Copy destination  
                     FLOPPY: Floppy disk drive  
                     SCSI0 to SCSI7: SCSI device

Example    Copy a file of measured data named TEST.  
             WCSELECT, TEST, FLOPPY

Comments    • p1=REPORT is effective only with the optional report  
    function.  
                     • Parameter p3 is effective only with the optional SCSI  
    function.

**DW**      **Writes one scan's worth of measured/computed data.**

Mode      Operation mode  
 Setting    DWp1<terminator>  
             p1      0: Writes one scan's worth of measured/  
    computed data (default).

Example    Write one scan's worth of measured/computed data.  
             DW0

**ME**      **Deletes a file on a RAM disk.**

Mode      Operation mode  
 Setting    MEp1<terminator>  
             p1      File type  
                     DAT: measured/computed data file  
                     DAS: periodic file  
                     RBI: report file  
             p2      File name (up to eight characters)

Example    Delete a file with measured data (TEST)  
             ME DAT, TEST

Comments    • The parameter cannot be omitted.

**MY**      **Converts a file of measured/computed data and periodic file to an ASCII-format file and then copies it.**

Mode      Operation mode  
 Setting    MYp1, p2, p3, p4, p5<terminator>  
             p1      File name (up to eight characters)  
             p2      First channel number for ASCII conversion  
             p3      Last channel number for ASCII conversion  
             p4      First data number for ASCII conversion  
             p5      Last data number for ASCII conversion  
             p6      Copy destination  
                     FLOPPY: Floppy disk drive  
                     SCSI0 to SCSI7: SCSI device

Example    Make an ASCII conversion of data numbers 1 to 100 from  
                  the input channels 005 to 010 in the file TEST on the  
                  RAM disk and make a copy of them on a floppy disk.  
             MYTEST, 005, 010, 1, 100

Comments    • Parameters p4 and p5 are set in the range from 1 to  
    the last data number in the file.  
                     • Channel numbers are recognized in the order of input  
    channel and channel for computation. If you set 005  
    for the first channel and A10 for the last channel, an  
    ASCII conversion will be made in input channel 005  
    to the last input channel as well as channels A01 to  
    A10 for computation.  
                     • This command is not executable during computation.  
                     • Parameter P6 is effective only with the optional SCSI  
    function.

**FV**      **Stores setting data on a floppy disk or SCSI device.**

Mode      Operation mode  
 Setting    FVp1, p2<terminator>  
             p1      Media  
                     FLOPPY: Floppy disk  
                     SCSI0 to SCSI7: SCSI device  
             p2      File name (up to eight characters)

Example    Store the setting data with the file name SET1.  
             FVFLOPPY, SET1

Comments    • Setting data in the setup mode cannot be stored. To  
    store them, use a YV command.  
                     • This command is not executable during computation.

**FL**      **Reads the setting data from a floppy disk or SCSI device.**

Mode      Operation mode  
 Setting    FLp1, p2, p3<terminator>  
             p1      Media  
                     FLOPPY: Floppy disk  
                     SCSI0 to SCSI7: SCSI device  
             p2      Method of reading data:  
                     DIRECT      Starts reading data immediately  
    after sending an FL command.  
                     TRIG\_1 to 3      Starts reading data at the same  
    time as an event occurrence in  
    event/action functions.  
             p3      File name (up to eight characters)

Example    Read setting data with the file name SET1 immediately.  
             FLFLOPPY, DIRECT, SET1

Comments    • Setting data in the setup mode cannot be read. To  
    read them, use a YL command.  
                     • If TRIG\_1 to TRIG\_3 are set to p1, event/action  
    functions need to set FLOPPY:LD\_TRG1 to 3 for  
    their actions.  
                     • This command is not executable during computation.

**FE**      **Deletes a file on a floppy disk or SCSI device.**

Mode      Operation mode  
 Setting    FEp1, p2, p3<terminator>  
             p1      Media  
                     FLOPPY: Floppy disk  
                     SCSI0 to SCSI7: SCSI device  
             p2      Type of file  
                     DAT: Measured/computed data  
                     PNL: Settings of operation mode  
                     SET: Settings of setup mode  
                     CSV: ASCII-converted measured/computed  
    data  
             p3      File name (up to eight characters)

Example    Delete the measured data file with the file name TEST.  
             FEFLOPPY, DAT, TEST

Comments    • The parameters cannot be omitted.

**YV**      **Stores set data in the setup mode on a floppy disk or SCSI device.**

Mode      Setup mode  
 Setting    YVp1, p2<terminator>  
             p1      Media  
                     FLOPPY: Floppy disk  
                     SCSI0 to SCSI7: SCSI device  
             p2      File name (up to eight characters)

Example    Store set data in the setup mode with the file name SET1.  
             YVFLOPPY, SET1

Comments    • This command is not executable during computation.

**YL Reads set data in the setup mode from a floppy disk or SCSI device.**

Mode	Setup mode
Setting	YLp1, p2<terminator>
	p1 Media
	FLOPPY: Floppy disk
	SCSI0 to SCSI7: SCSI device
	p2 File name (up to eight characters)
Example	Read set data in the setup mode, which are on the disk with the file name SET1. YLFLOPPY, SET1
Comments	• This command is not executable during computation.

**YE Deletes a file on a floppy disk or SCSI device (Setup Mode).**

Mode	Setup mode
Setting	YE p1, p2, p3<terminator>
	p1 Media
	FLOPPY: Floppy disk
	SCSI0 to SCSI7: SCSI device
	p2 Type of file
	DAT: Measured/computed data
	PNL: Settings of operation mode
	SET: Settings of setup mode
	CSV: ASCII-converted measured/computed data
	DAS: Periodic file
	RBI: Report data
	p3 File name (up to eight characters)
Example	Delete the file SET2 with settings of setup mode. YEFLOPPY, SET, SET2
Comments	• The parameters cannot be omitted.

**BL Executes the initial balancing of the strain input channel**

Mode	Operation mode
Setting	BLp1, p2, p3<terminator>
	p1 The first channel for executing the initial balancing
	p2 The last channel for executing the initial balancing
	p3 Select either initial balancing or initialization
	EXEC: Execute initial balancing
	INIT: Execute initialization
Example	Execute initial balancing on subunit 0 and channels 01 to 08. BL001, 008, EXEC
Comments	<ul style="list-style-type: none"> <li>Channels other than strain input channels or channels that are not connected within the specified range are ignored.</li> <li>Initial balancing and initialization can not be executed during a report.</li> <li>If initial balancing is executed, number-of-channels worth of data are returned in the following format.</li> </ul> <p>S1 S2 CCC DDCrLf</p> <p>S1: Data status 1 N: Normal S: SKIP</p> <p>S2: Data status 2 Space: Data in the middle E: Data at the end</p> <p>CCC: Channel number</p> <p>DD: Result of the initial balancing OK: Initial balancing succeeded NG: Initial balancing failed DF: Default values set _: Skip module</p>

**DR Start/stop the report**

Mode	Operation mode
Setting	DRp1<terminator>
	p1 Start/stop the report
	0: Start the report
	1: Stop the report
Example	Start the report. DR0
Comments	<ul style="list-style-type: none"> <li>Effective only on instruments with the optional report function.</li> <li>Measurement range, date, time cannot be changed during a report. Copy using the range copy ON also cannot be executed during a report.</li> <li>All report data up to that point are cleared when a report is started.</li> <li>This setting is effective when one of hourly, daily and monthly reports is ON.</li> </ul>

**RS Reconstruct the system.**

Mode	Operation mode
Setting	RSp1<terminator>
	p1 0 The system is reconstruct.
Example	Reconstruct the system. RS0
Comments	<ul style="list-style-type: none"> <li>Reconstruct the system. Execute this command if a subunit or a module is newly added or a module in a slot is replaced.</li> <li>Since it takes an indefinite time to execute the RS command, return an ACK after processing. On the controller side, execute the following processing after receiving an ACK after transmitting the RS command. The format of the ACK status is as shown below.</li> </ul> <p>E0Cr+Lf The received command was normally processed.</p> <p>E1Cr+Lf There is an error in the received command.</p> <ul style="list-style-type: none"> <li>After executing the command, the clock is initialized to 96/01/01 00:00:00.</li> </ul>

**RC Initialize the set values.**

Mode	Operation mode
Setting	RCp1<terminator>
	p1 0 The set values are initialized.
Example	Initialize the operation mode parameters (measuring range, unit, alarm, date & time, and moving average). RC0
Comments	<ul style="list-style-type: none"> <li>Since it takes an indefinite time to execute the RC command, return an ACK after processing. On the controller side, execute the following processing after receiving an ACK after transmitting the RC command. The format of the ACK status is as shown below.</li> </ul> <p>E0Cr+Lf The received command was normally processed.</p> <p>E1Cr+Lf There is an error in the received command.</p> <ul style="list-style-type: none"> <li>After executing the command, the clock is initialized to 96/01/01 00:00:00.</li> </ul>

**DS Transfers the setting mode.**

Mode	All modes
Setting	DSp1<terminator>
	p1 0 Transfers to operation mode.
	1 Transfers to setup mode.
	2 Transfers to A/D calibration mode.
Example	Transfer the DC100 mode to the setup mode. DS1

- Comments
- Since it takes an indefinite time to execute the DS command, return an ACK after processing. On the controller side, execute the following processing after receiving an ACK after transmitting the DS command. The format of the ACK status is as shown below.
- E0Cr+Lf The received command was normally processed.
- E1Cr+Lf There is an error in the received command.

### MI Initializes the built-in RAM.

- Mode Operation mode
- Setting MIp1<terminator>
- p1 YES(fixed)
- Example MIYES
- Comments
- Initializing the built-in RAM clears all the data in the built-in RAM. Copy necessary files to the floppy disk/SCSI device.

## 6.7 Data Output Request Command

### TS Selects the output data.

- Mode All modes (A/D calibration data output is limited to A/D calibration mode only.)
- Setting TSp1<terminator>
- p1 0 Measured data output  
1 Setting data output  
2 Unit data output  
3 RAM disk data output  
4 Report data output  
5 System configuration data output  
8 A/D calibration data output  
9 Setting data output in setup mode
- Comments
- The setting for p1=0, 1, 2, 3 or 4 is effective only in the operation mode.
  - The setting for p1=8 is effective only in the A/D calibration mode.
  - The setting, p1=4 is effective when the instrument has the report function and one of hourly, daily and monthly reports is ON.

### FM Selects the output format for measured/computed data.

- Mode Operation mode
- Setting FMp1, p2, p3<terminator>
- p1 0 Outputs measured data in ASCII format.  
1 Outputs measured data in binary format.  
2 Outputs computed data in ASCII format.  
3 Outputs computed data in binary format.
- p2 First output channel (001 to 560)  
First output computed channel (A01 to A60)
- p3 Last output channel (001 to 560)  
Last output computed channel (A01 to A60)
- Comments
- You must specify data to be output with the TS command and execute "GET" or "ESC T" before sending the FM command.
  - The command selects the output format of measured/computed data, either ASCII or binary, and the output channel.
  - If no input channel is recognized by the DC100 among the specified channels, a syntax error occurs.
  - The setting "p1=2" or "p1=3" is valid only for recorders with the optional computing function or installed a pulse module.
  - The optional computation channel number for a stand-alone model is A01 to A30.

### MF Sets the output formats of the measureddata/computed file or periodic file data on a RAM disk.

- Mode Operation mode
- Setting MFp1, p2, p3, p4, p5, p6<terminator>
- p1 Output contents  
0 File directory  
1 Measured/computed file or periodic file data output in ASCII format.  
2 Measured/computed file or periodic file data output in binary format  
3 On/off information on channel on which specified file exists  
4 Specified report data output in binary format
- p2 File name (up to eight characters)
- p3 First output channel number
- p4 Last output channel number
- p5 First output data number
- p6 Last output data number

- Comments
- Always specify data that are output with TS command before sending MF command, and execute [GET] or [ESCT].
  - If p1 is set to 0 (file directory), the settings for p2 to p6 will be invalid.
  - Afile directory cannot be output while copying measured/computed data.
  - If p1 is set to 3 (on/off information on the channel on which the specified file exists), the settings for p5 and p6 will be invalid.
  - Parameters p5 and p6 are set in the range from 1 to the last data number in a file.
  - Channel numbers are recognized in the order of input channel and channel for computation. If you set 005 for the first channel and A10 for the last channel, the target computation will be done in input channel 005 to the last input channel as well as channels A01 to A10.
  - p1=4 is valid only on the DC100 with the report function option. When p1=4, p3 and p4 are R01 to R60.

### RF Selects the output format of the report.

- Mode Operation mode
- Setting RFp1, p2, p3<terminator>
- p1 0 Output hourly report data  
1 Output daily report data  
2 Output monthly report data  
3 Output the status of the hourly/daily/monthly data
- p2 First channel for output (R01 to R60)
- p3 Last channel for output (R01 to R60)
- Comments
- Effective only on instruments with the optional report function.
  - Before transmitting the RF command, be sure to specify the data to output using the TS command and execute “GET” or “ESCT.”
  - If the daily report is to be output using extended format, the extended information must be output within 1 hour from the creation of the report. If the monthly report is to be output using extended format, the extended information must be output within 1 day from the creation of the report. After that, the extended information can not be output.
  - If there is no valid data within the specified report channel range, “FFFFH” is output.
  - If p1 is set to 3, the settings for p2 and p3 will be invalid.

### LF Specifies the output channels for setting data output, unit, and decimal point data.

- Mode All modes
- Setting LFp1, p2<terminator>
- p1 First output channel (001 to 560)  
First output computed channel (A01 to A60)
- p2 Last output channel (001 to 560)  
Last output computed channel (A01 to A60)
- Comments
- You must specify data to be output with the TS command and execute “GET” or “ESC T” before sending the LF command.
  - If no input channel is recognized by the DC100 among the specified channels, a syntax error occurs.
  - The optional computation channel number for a stand-alone model is A01 to A30.

### CF Specifies the system configuration output format.

- Mode All modes
- Setting CFp1<terminator>
- p1 0 Information on system-configured modules  
1 Current status module information (real-time information)
- Comments
- You must specify data to be output with the TS command and execute “GET” or “ESC T” before sending the CF command.

### M1 Requests to output the file specified by \_M0

- Mode Operation mode
- Setting \_M1, p1<terminator>
- p1 Block number to output
- Example Request to output the data of block 3.  
\_M1, 3
- Comments
- Specify the file name and the number of bytes of the output block beforehand using the \_M0 command.
  - You cannot omit parameters
  - The number of blocks of output data can be checked with the returned value of the \_M0 command.
  - You can reconstruct the original file by combining the blocks of data that was output into one file. You can combine the data into one file on the PC.
  - The output format is as follows.



A data length of zero is output in the following cases.

- When the file has not been opened with the \_M0 command.
- When the specified file does not exist.
- When the block number exceeds the number of blocks of the file.

### BO Specifies the order of byte output (in binary output).

- Effective mode Operation mode
- Setting BOp1<terminator>
- p1 0 Output from MSB (upper-digit byte)  
1 Output from LSB (lower-digit byte)

### IM Specifies the mask of a status byte.

- Mode Operation mode
- Setting IMp1<terminator>
- p1 First numerical value of the items (or combination of those values) shown below
- 0 All interrupts are OFF.
- 1 Interrupt occurs at the end of an A/D conversion.
- 2 Interrupt occurs at the time of a syntax error.
- 4 Interrupt occurs when internal timer is being operated or the time for hourly, daily and monthly reports arrives.
- 8 Interrupt generated after storing data on media.
- 16 Interrupt generated when a file alarm occurs.
- 32 Interrupt generated when measurement release is generated while computation is in progress.
- Comments
- Masks the causes of interrupt in the status byte.
  - When either of the phenomena effectively specified with this command occurs, bit 7 (SRQ) of the status byte is set to “1” and causes an interrupt to the controller.
  - For detailed instructions on the status byte, see Pages 1-2 and 2-2.

<b>SM</b>	<b>Sets the auxiliary mask of the status byte.</b>
Mode	Operation mode
Setting	SMp1<terminator> p1 A figure determined by the following calculation: $p1 = a + b + c + d + e + f + g$ a=1 Interrupt occurs when timer No. 1 operates. =0 No interrupt occurs. b=2 Interrupt occurs when timer No. 2 operates. =0 No interrupt occurs. c=4 Interrupt occurs when timer No. 3 operates. =0 No interrupt occurs. d=8 Interrupt occurs when timer No. 4 operates. =0 No interrupt occurs. e=16 Interrupt occurs when timer No. 5 operates. =0 No interrupt occurs. f=32 Interrupt occurs when timer No. 6 operates. =0 No interrupt occurs. g=64 Interrupt occurs when the time for hourly, daily and monthly reports arrives. =0 No interrupt occurs.
Comments	<ul style="list-style-type: none"><li>• Sets the auxiliary mask of interrupt when the timers described in the IM command operate.</li><li>• When any of the timers whose numbers are specified with this command operates, an interrupt due to the internal time operation occurs.</li></ul>

## 7.1 Functions as Talker

There are the following eighteen types of data output:

- Measured data output (ASCII code): TS0 + "Device Trigger (GET)" + FM0
- Measured data output (binary code): TS0 + "Device Trigger (GET)" + FM1
- Computed data output (ASCII code): TS0 + "Device Trigger (GET)" + FM2
- Computed data output (binary code): TS0 + "Device Trigger (GET)" + FM3
- Setting of data output in the operation mode: TS1 + "Device Trigger (GET)" + LF
- Unit and decimal point position data output: TS2 + "Device Trigger (GET)" + LF
- System configuration data output: TS5 + "Device Trigger (GET)" + CF
- A/D calibration data output: TS8 + "Device Trigger (GET)" + LF
- Setting of data output in the setup mode: TS9 + "Device Trigger (GET)" + LF
- Outputting of a file directory on a RAM disk: TS3 + [GET] + [MF0]
- Outputting of measured/computed data (ASCII code) on a RAM disk: TS3 + [GET] + MF1
- Outputting of the measured/computed data (binary code) on a RAM disk: TS3 + [GET] + MF2
- Outputting of channel on/off on a RAM disk: TS3 + [GET] + MF3
- Outputting of report data on a RAM disk: TS3 + [GET] + MF4
- Output the hourly report using the report function: TS4 + [GET] + RF0
- Output the daily report using the report function: TS4 + [GET] + RF1
- Output the monthly report using the report function: TS4 + [GET] + RF2
- Output the status of the hourly/daily/monthly report: TS4 + [GET] + RF3

### Measured/computed or report data output (TS0/TS3)

After executing "GET," be sure to output data using the FM or MF command. Execution of "GET" alone without executing the FM or MF command does not output the data. After reading all the data specified by the FM command, subsequent specification of the FM command without executing "GET" enables the data within a scan to be output.

Because the MF command requests the output of data stored on the internal RAM disk, so a differential in time occurs between the time when the data are measured and the time when [GET] is executed.

### Setting to data output (TS1, TS2, TS8 or TS9)

After transmitting the device trigger "GET" be sure to output data using the LF command. Execution of "GET" alone without executing the FM command does not output the data. After reading all the data specified by the LF command, subsequent specification of another channel using the LF command enables the data contents to be output. A/D calibration data output by the TS8 command can be executed in the A/D calibration mode only.

### Report output (TS4)

After transmitting the device trigger "GET" be sure to read the data using the RF command. Execution of "GET" alone without executing the RF command does not read the data. After reading all the specified data with the RF command, subsequent specification of another channel using the RF command without executing "GET" enables that data to be read.

### System configuration output (TS5)

After transmitting the device trigger "GET" be sure to output data using the CF command. Execution of "GET" alone without executing the CF command does not output data.

#### Note

- When using an RS-232-C, RS-422-A or RS-485 interface, execute an ESCT command rather than a GET command.
- Do not transmit the FM, LF, CF, MF, RF command before outputting data for specified channels.
- If an FM, LF, CF, MF, RF command is received while data are being transmitted, transmission of the data is suspended automatically.
- If the type of output data is changed using the TS command after the execution of "GET," the changed contents are not reflected without executing "GET" again. Execute "GET" again.
- After executing "GET," the execution of "GET" again without outputting data using the FM, LF, CF, MF, RF command or without completing the data output sets new data to the buffer. Be careful because old data are lost.

## 7.2 Measured/Computed Data Output Format (ASCII code)

The data are output in the following format by receiving TS0 + “Device Trigger (GET)” + FM0/FM2:

**DATEYYMMDDCrLf**

**TIMEhhmmssCrLf**

**S1S2A1A1A2A2A3A3A4A4UUUUUUCCCC, ±DDDDDE - ECrLf**

Each symbol denotes the following:

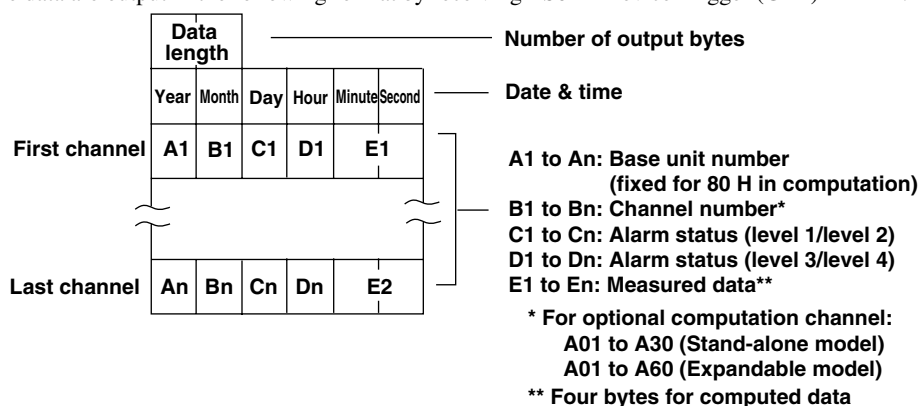
YY:	Year
MM:	Month
DD:	Day
hh:	Hour
mm:	Minute
ss:	Second
S1:	Data status 1
	E ----- Abnormal
	N ----- Normal
	D ----- Differential input
	O ----- Over
	S ----- Measuring range is “skip” or computation channel is “off”
S2:	Data status 2
	Space ----- Interim data
	E ----- Last data
A1A1:	Alarm status (level 1)
A2A2:	Alarm status (level 2)
A3A3:	Alarm status (level 3)
A4A4:	Alarm status (level 4)
	H □ ----- Upper-limit alarm
	L □ ----- Lower-limit alarm
	dH ----- Upper-differential-limit alarm
	dL ----- Lower-differential-limit alarm
	RH ----- Increasing rate-of-change limit alarm
	RL ----- Decreasing rate-of-change limit alarm
UUUUUU:	Unit
	mV □□□□ --- mV
	V □□□□ □ -- V
	□ C □□□□ □ -- °C
	UUUUUU ----- Arbitrary
CCC:	Channel number
±:	Data polarity (+, -)
DDDDD:	Data mantissa (8 characters for the computation channel)
	±99999 ----- Over data
	+99999 ----- Abnormal data
E - E:	Data exponent

### Note

- Data in the channel not connected in the system settings, including channel numbers, are not output.
- In a channel for data computation, the channel number CCC is indicated as follows:  
Stand-alone model: A01 to A30  
Expandable model: A01 to A60

## 7.3 Measured/Computed Data Output Format (Binary code)

The data are output in the following format by receiving TS0 + “Device Trigger (GET)” + FM1:



### Data length

The number of output bytes can be determined using the following equation.

Number of output bytes = 6 x N + 6 (N = number of output channels)

Number of output bytes = 8 x M + 6 (M = number of output channels)

### Alarm status (C1 to Cn/D1 to Dn)

- 0: No alarm
- 1: Upper-limit alarm
- 2: Lower-limit alarm
- 3: Upper-differential-limit alarm
- 4: Lower-differential-limit alarm
- 5: Increasing rate-of-change limit alarm
- 6: Decreasing rate-of-change limit alarm

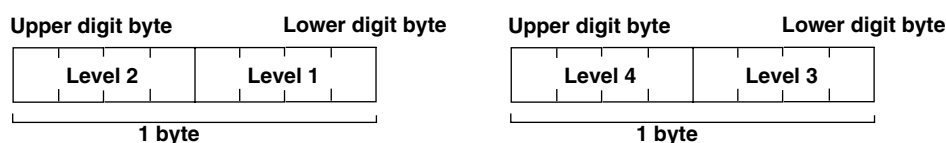
### Measured data (E1 to En)

- 7FFFH (7FFF7FFFH): Positive over-limit data
- 8001H (80018001H): Negative over-limit data
- 8002H (80028002H): Measurement range setting skips.
- 8004H (80048004H): Abnormal data
- 8005H (80058005H): No data

\*Data inside the parentheses ( ) are computed data.

### Alarm status format

For the alarm status, one byte indicates two levels.



The status of two levels is output in hexadecimal notation. For example, if the level 1 alarm status is 2 (lower-limit alarm) and the level 2 alarm status is 4 (lower-differential-limit alarm), 42H is output.

### Note

- The output data are all output in hexadecimal notation.
- Measured data can be output either from the MSB (upper digit) or LSB (lower digit) according to the specification of the output order.  
 Since the instrument determines upper byte and lower byte in units of 2-byte data, the 4-byte computed data are output in the following way.  
 If MSB(upper byte): "ABCD"  
 If LSB(lower byte): "BADC"  
 The default of BO command is "MSB"
- Data in the channel not connected in the system settings, including channel numbers, are not output.

## 7.4 Setting Data Output Format (Operation mode)

The operation mode parameters are output in the following order by the TS1 + "Device Trigger (GET)" + LF command:

WS	Writing of data into the built-in RAM	CrLf	SG	Setting data for No. 1 message	CrLf
PS	Status of Collector	CrLf	SG	Setting data for No. 20message	CrLf
SR	Measurement range setting data for the first channel	CrLf	SI	Setting data for No.1 timer	CrLf
SR	Measurement range setting data for the last channel	CrLf	SI	Setting data for No.6 timer	CrLf
SO	Computation expression setting data for the first computation channel	CrLf	SQ	Setting data for No.1 match time	CrLf
SO	Computation expression setting data for the last computation channel	CrLf	SQ	Setting data for No.3 match time	CrLf
SN	Scaling unit setting data for the first channel	CrLf	SL	Setting data for No.1 event action	CrLf
SN	Scaling unit setting data for the last channel	CrLf	SL	Setting data for No.30 event action	CrLf
SA	Alarm setting data for the first channel	CrLf	SV	Moving average setting data for the first channel	CrLf
SA	Alarm setting data for the last channel	CrLf	SV	Moving average setting data for the last channel	CrLf
ST	Tag setting data for the first channel	CrLf	SX	Setting data for No. 1 group	CrLf
ST	Tag setting data for the last channel	CrLf	SX	Setting data for No. 1 group	CrLf
			SW	Setting data for summer/winter time	CrLf
			SK	Constant setting data for the first constant number	CrLf
			SK	Constant setting data for the last constant number	CrLf
			MH	Data saving ON/OFF setting data for the first channel	CrLf
			MH	Data saving ON/OFF setting data for the last channel	CrLf
			MW	MW Settings for the method of saving data	CrLf
			MX	Setting data(Periodic File/Report File)to Save	CrLf
			UD	Setting data for the display mode on the upper part of the display	CrLf
			MD	Setting data for the display mode on the middle part of the display	CrLf
			LD	Setting data for the display mode on the lower part of the display	CrLf
			EN	Output completed	CrLf

Setting data for the channels in the range specified by the LF command are output for every subunit. Channel numbers are output in the order of input channels and computation channels. For example, when LF005 and A10 are set, the data are output starting from the input channel 005 to the last input channel. Then, the data are output starting from computation channels A01 to A10. Data are output in the order of setting parameters subsequent to the setting command. Each data item is delimited with a comma (,).

Alarm setting data

For alarm setting data, setting data from level 1 to level 4 are output for every channel.

First channel	SA	Level 1 alarm setting data	CrLf
	⋮	Level 2 alarm setting data	CrLf
	⋮	Level 3 alarm setting data	CrLf
	SA	Level 4 alarm setting data	CrLf
Second channel	SA	Level 1 alarm setting data	CrLf
	⋮	Level 2 alarm setting data	CrLf
	⋮	Level 3 alarm setting data	CrLf
	SA	Level 4 alarm setting data	CrLf
⋮	⋮	⋮	⋮
	⋮	⋮	⋮
	⋮	⋮	⋮
	⋮	⋮	⋮
Last channel	SA	Level 1 alarm setting data	CrLf
	⋮	Level 2 alarm setting data	CrLf
	⋮	Level 3 alarm setting data	CrLf
	SA	Level 4 alarm setting data	CrLf

## 7.5 Setting Data Output Format (Setup mode)

The setup mode parameters are output in the following order by the TS9 + “Device Trigger (GET)” + LF command:

<b>XR</b>	Setting data for for measurement period	<b>CrLf</b>
<b>XA</b>	Setting data for alarm	<b>CrLf</b>
<b>XI</b> ⋮ <b>XI</b>	A/D integration time setting data for the first unit ⋮ A/D integration time setting data for the last unit	<b>CrLf</b> ⋮ <b>CrLf</b>
<b>XQ</b>	Setting data for filter on/off	<b>CrLf</b>
<b>XY</b> ⋮ <b>XY</b>	Setting data for reflash relay 1 ⋮ Setting data for reflash relay 6	<b>CrLf</b> ⋮ <b>CrLf</b>
<b>XN</b> ⋮ <b>XN</b>	AND/OR setting data for the relay in the first unit ⋮ AND/OR setting data for the relay in the last unit	<b>CrLf</b> ⋮ <b>CrLf</b>
<b>XD</b> ⋮ <b>XD</b>	Setting data for energizing/deenergizing the first relay ⋮ Setting data for energizing/deenergizing the last relay	<b>CrLf</b> ⋮ <b>CrLf</b>
<b>XH</b>	Setting data for a hold/non-hold of the relay	<b>CrLf</b>
<b>XK</b>	Setting data for a key lock	<b>CrLf</b>
<b>XB</b> ⋮ <b>XB</b>	Burnout setting data for the first channel ⋮ Burnout setting data for the last channel	<b>CrLf</b> ⋮ <b>CrLf</b>
<b>XJ</b> ⋮ <b>XJ</b>	Reference junction compensation setting data for the first channel ⋮ Reference junction compensation setting data for the last channel	<b>CrLf</b> ⋮ <b>CrLf</b>
<b>XF</b>	Setting data for the function screen	<b>CrLf</b>
<b>XS</b>	Setting data for the setting screen	<b>CrLf</b>
<b>XV</b>	Setting data for measurement interval	<b>CrLf</b>
<b>XT</b>	Setting data for the temperature unit	<b>CrLf</b>
<b>XG</b>	Setting data for computation error	<b>CrLf</b>
<b>RO</b>	Settings of the report function (planned for future release)	<b>CrLf</b>
<b>RM</b>	Settings of the report channel (planned for future release)	<b>CrLf</b>
<b>XM</b>	Settings relating to RAM disk	<b>CrLf</b>
<b>YI</b>	Setting SCSI ID number	<b>CrLf</b>
<b>EN</b>	Output completion	<b>CrLf</b>

Channel numbers are output in the order of input channels and computation channels. For example, when LF005 and A10 are set, the data are output starting from the input channel 005 to the last input channel. Then, the data are output starting from computation channels A01 to A10.

Data are output in the order of setting parameters subsequent to the setting command. Each data item is delimited with a comma (,).

### Range of outputting

If output data are issued on a unit or slot basis, the number of units or slots to which the data are output is determined by specified channels. For example, if channels 042 to 236 are specified by the LF command, data from slot 4 of subunit 0 to slot 3 of subunit 2 are output.

### Note

- Data which are output for burnout and reference junction compensation are those of the channel up to the maximum number connected for every subunit in the specified range.
- Data which are output for the A/S integration time and AND/OR of relays are those of connected channels.
- Data which are output for energizing/deenergizing relays are output on the basis of the unit to which the module is connected.
- The data of XH command and XY command are output only when DI/DO module or alarm output module is mounted to DC100.
- “S” as data of XN command is meaningless.

## 7.6 Output Format for Unit and Decimal Point Position

These outputs are issued in the following format by the TS2 + “Device Trigger (GET)” + LF command.

**S1S2CCCCUUUUUU, PCrLf**

Each symbol denotes the following:

S1:	Data status 1
	N ----- Normal
	D ----- Differential input
	S ----- Measurement range skips.
S2:	Data status 2
	Space ----- Interim data
	E ----- Final data
CCC:	Channel number (3 characters)
	Computation channels
	A01 to A30 (stand-alone model)
	A01 to A60 (expandable model)
UUUUUU:	Unit (6 characters)
	mV □□□□----- mV
	V □□□□□----- V
	□ C □□□□□----- °C
	UUUUUU----- arbitrary
P:	Decimal point position (0 to 4)
	0 ----- 00000
	1 ----- 0000.0
	2 ----- 000.00
	3 ----- 00.000
	4 ----- 0.0000

**Note**

- Data in the channels not connected in the system settings, including channel numbers, are not output.

1000

**M : sssssCrLf**

Slot number

M: Measurement interval mark

S1: Subunit number

0----- Subunit or stand-alone model

E ----- End mark

COMM----- Communication module

RELAY ----- Relay output module

REMOTE ----- Remote module

INPUT ----- Universal input module

mA----- mA-input module

AC ----- Power monitor module

STRAIN ----- Strain input module

PULSE ----- Pulse input module

DI ----- Digital input module

XXXXXX ----- Module not installed

- The number and data of subunits not connected in the system settings are not output.

- The number and data of subunits not connected in the system settings are not output.

## 7.8 A/D Calibration Data Output Format

A/D calibration data are output in the following format by the TS8 + “Device Trigger (GET)” + LF command: This is effective only in the A/D calibration mode.

<b>XZ</b> ⋮	<b>A/D calibration data for the first slot</b> ⋮	<b>CrLf</b> ⋮
<b>XZ</b>	<b>A/D calibration data for the last slot</b>	<b>CrLf</b>
<b>EN</b>	<b>Output completion</b>	<b>CrLf</b>

Calibration data are output for every slot after the command to execute A/D calibration. The output format is the same form as in the XZ command setting shown below.

XZ subunit number, slot number, DISPLAY, calibration item CrLf  
All calibration items are output.

### Range of outputting

The number of slots to which A/D calibration data are output is determined by the channels specified by the LF command. For example, if channels 042 to 236 are specified by the LF command, data from subunit 0, slot 4 to subunit 2, slot 3 are output.

## 7.9 RAM Disk Output Format (File Directory Output)

The following formats are output by the TS3 + [GET] + MF0 command.

**FFFFFFFF, YY/MM/DD hh:mm, NNNNNN, CCC, MMCrLf**

-----

**\_FFFFFFFF, YY/MM/DD hh:mm, NNNNNN, CCC, MMCrLf**

**\_ENDCrLf**

Each symbol denotes the following:

A: File status

\_(space): File after the completion of writing

\*: File in the process of writing

FFFFFFFF: File name (eight characters)

YY/MM/DD hh:mm: Date and time (year/month/day hour: minute) when a trigger signal or data storage is started.

Date and time of timeout for report files.

NNNNNN: Amount of data stored Extension number for report files. (six characters)

CCC: Number of channels in which data are stored

MM: Memory in which data are stored or report file

Stand-alone: stand-alone models

Expandable: expandable models

OTHER: other models

Hourly: hourly file

Daily: daily file

Monthly: monthly file

### Note

- If the RAM disk is faulty or if there are no files at all containing measured/computed data on the RAM disk, the character string “# ERROR ON DATA MEMORY” will be output.
- If you attempt to output a file directory while copying measured/computed data, the DC100 outputs the text “#UNABLE TO OUTPUT.”

## 7.10 RAM Disk Output Format (ASCII Code)

The following formats are output by the TS3 + [GET] + MF1 command.

<b>Header</b>	AAAAAA-BBBBBB, CCCCCC,DDD-EEECH, FFFFFGGGCrLf YY-MM-DD hh:mm:ssCrLf
<b>First Data Number</b>	*SNNNNNNCrLf
<b>Date and Time</b>	YY-MM-DD hh:mm:ss.sCrLf
<b>First Data</b>	S1S2UUUUUUCCCC, ±DDDDDE-EpCrLf
-----	
<b>Last Data Number</b>	*SNNNNNNCrLf
<b>Date and Time</b>	YY-MM-DD hh:mm:ss.sCrLf
<b>Last Data</b>	S1S2UUUUUUCCCC, ±DDDDDE-EpCrLf

Each symbol denotes the following:

### Header

AAAAAA: First output data (six characters)  
 BBBBBB: Last output data (six characters)  
 CCCCCC: Data number of trigger position (six characters)  
 DDD: First output channel (three characters)  
       Channel for computation  
       A01 to A30 (stand-alone model)  
       A01 to A60 (expandable model)  
 EEE: Last output channel (three characters)  
       Channel for computation  
       A01 to A30 (stand-alone model)  
       A01 to A60 (expandable model)  
 FFFFF: Data save interval (five characters)  
 GGG: Unit of data save interval (three characters)  
 YY-MM-DD hh:mm:ss  
       Year-Month-Day Hour:Minute:Second

### Data number

\*: Indicates information for data numbers.  
 S: Trigger information  
       Space ----- other than a trigger point  
       T ----- trigger point  
 NNNNNN: Data number (six characters)

### Date and Time

Date and time when the data are saved.  
 The time is in 0.5-second units (the .s field is '.0' or '.5') depending on the measurement interval used.

### Data

S1: Data status 1  
       N ----- normal  
       O ----- over (data of ±99999)  
       S ----- skip (data of all space)  
       E ----- abnormal  
 S2: Data status 2  
       Space ----- interim data  
       E ----- last data  
 UUUUUU: Units (six characters)  
       mV [ ] [ ] [ ] [ ] ----- mV  
       V [ ] [ ] [ ] [ ] ----- V  
       [ ] C [ ] [ ] [ ] [ ] ----- °C  
       UUUUUU ----- arbitrary

**7.10 RAM Disk Output Format (ASCII Code)**

---

CCC: Channel number (three characters)  
Channel for computation  
A01 to A30 (stand-alone model)  
A01 to A60 (expandable model)

±: Data polarity (+, -)

DDDDD: Data mantissa (eight characters for computed data)  
± 99999 ----- data overflow  
+ 99999 ----- abnormal data

E - E: Data exponent

**Note**

---

- If the RAM disk is faulty, the character string “# ERROR ON DATA MEMORY” will be output.
  - If there are no appropriate files, the character string “# FILE NAME ERROR” will be output.
-

## 7.11 RAM Disk Output Format (Binary Code)

The following formats are output by the TS3 + [GET] + MF2 command.

<b>Header information</b>	Same as for ASCII code
<b>Channel information</b>	<EOI>
<b>Data</b>	<EOI>

**Header information** AAAAAA-BBBBBB, CCCCCC, DDD-EEECH, FFFFFGGGCrLf  
YY-MM-DD hh:mm:ssCrLf  
**Channel information** S1S2CCUUUUUU, PCrLf

Each symbol denotes the following:

### Header

AAAAAA: First output data (six characters)  
BBBBBB: Last output data (six characters)  
CCCCCC: Data number of trigger position (six characters)  
DDD: First output channel (three characters)  
Channel for computation  
A01 to A30 (stand-alone model)/A01 to A60 (expandable model)  
EEE: Last output channel (three characters)  
Channel for computation  
A01 to A30 (stand alone model)/A01 to A60 (expandable model)  
FFFFF: Data save interval (five characters)  
GGG: Unit of data save interval (three characters)

### Channel information

S1: Data status 1  
N ..... normal  
S ..... skip (data of 8002H)  
S2: Data status 2  
Space ..... interim data  
E ..... last data  
CCC: Channel number (three characters)  
Channel for computation  
A01 to A30 (stand alone model)/A01 to A60 (expandable model)  
UUUUUU: Units  
P: Position of decimal point (0 to 4)  
0 ..... AAAAA  
1 ..... AAAA. A  
2 ..... AAA. AA  
3 ..... AA. AAA  
4 ..... A. AAAAA

7.11 RAM Disk Output Format (Binary Code)

For Measured Data				For Computed Data			
1	2	3	4	1	2	3	4
Number of Output Bytes				Number of Output Bytes			
Measured data 1 (first CH)				Computed data 1 (first CH)			
⋮				⋮			
Measured data 1 (last CH)				Computed data 1 (last CH)			
Measured data 2 (first CH)				Computed data 2 (first CH)			
⋮				⋮			
Measured data 2 (last CH)				Computed data 2 (last CH)			
⋮				⋮			
Measured data n (first CH)				Computed data n (first CH)			
⋮				⋮			
Measured data n (last CH)				Computed data n (last CH)			
<EOI>				<EOI>			

The above number of output bytes is indicated as follows:  
Measured data: 2 x channel number x n byte (n: number of data items per channel)  
Computed data: 4 x channel number x n byte (n: number of data items per channel)

Invalid data are output as follows:  
Plus over data 7FFFH (7FFF7FFFH for computed data)  
Minus over data 8001H (80018001H for computed data)  
Measurement range setting is SKIP 8002H (80028002H for computed data)  
Abnormal data 8004H (80048004H for computed data)  
No dat 8005H (80058005H for computed data)  
Power failure 7F7FH(7F7F7F7FH for computed data)

- Note**
- The output data are all in hexadecimal format.
  - Measured data can be output with either the most significant byte or least significant byte following the order of output bytes with the BO command.
  - If the RAM disk is faulty, the character string “# ERROR ON DATA MEMORY” will be output.
  - If there are no appropriate files, the character string “# FILE NAME ERROR” will be output.
  - Power failure information data are only written to measured/computed data files. It is not written to periodic files.
  - One set of power failure informatin data are written when the power recovers from the power failure regardless of the writing period.

## 7.12 RAM Disk Output Format (Channel On/Off)

The following formats are output by the TS3 + [GET] + MF3 command.

```
_NNNNNNNNCrLf
_CCC-MMMCrLf
_-----
_ENDCrLf
```

Each symbol denotes the following:

NNNNNNNN	File name (eight characters)
CCC:	Channel number (three characters)
	Channel for computation
	A01 to A30 (stand alone model)/A01 to A60 (expandable model)
MMM:	With/without data
	ON ----- with data
	OFF ----- without data
END:	End

### Note

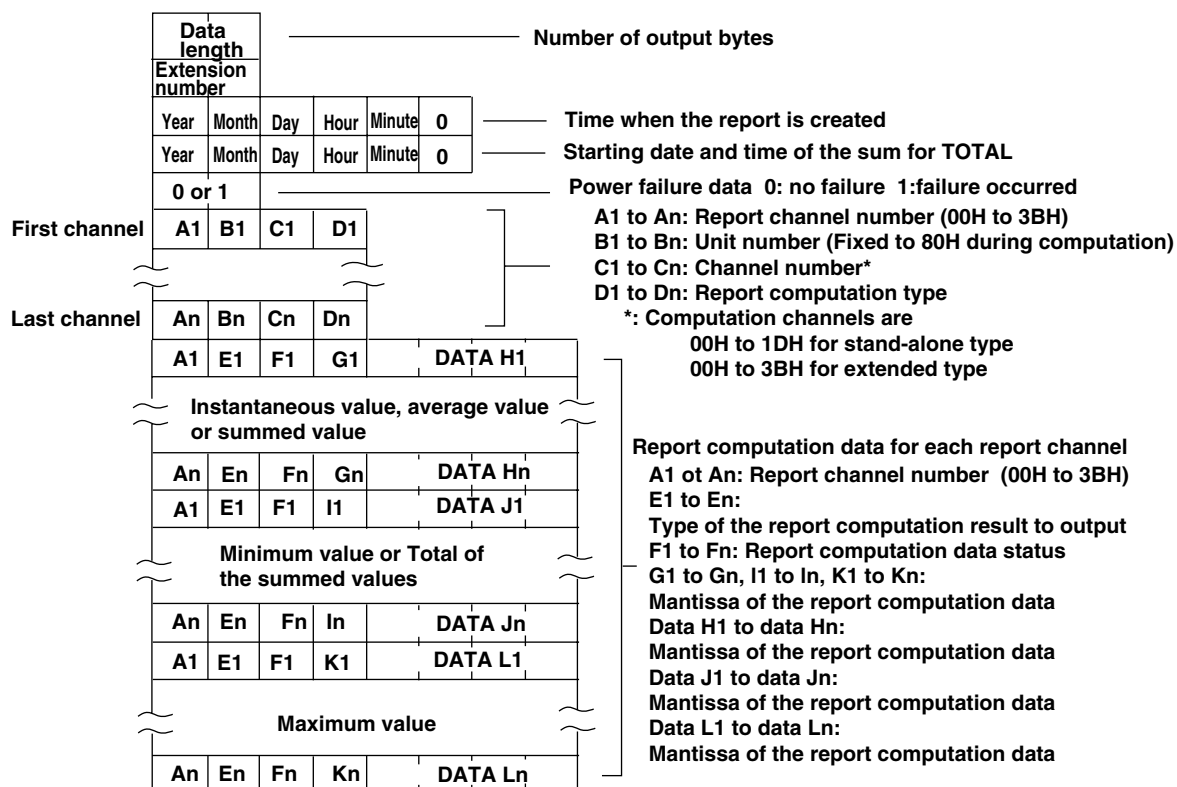
- The channel for computation is output subsequent to the channel for measurement.
- If the RAM disk is faulty, the character string “# ERROR ON DATA MEMORY” will be output.
- If there are no appropriate files, the character string “# FILE NAME ERROR” will be output.

## 7.13 Report Output Format

### Hourly report

The hourly report is output in the following format with the command, TS4+device trigger(GET)+RF0.

The hourly report file on the built-in RAM disk is output according to the following format with TS3+device trigger(GET)+MF4 command.



### Data length

The number of output bytes can be determined from the following expression.

Number of output bytes = 16 + 4 × N + 8 × N × 3 + (8 + 8 + N) × extension number

N: Number of output channels

### Report computation type

Output the type of computation set for each report channel.

00H: OFF

01H: INST (Instantaneous value)

02H: AVE (Average)

03H: SUM (Sum)

### The type of report computation result to output

The report computation results vary depending on the report computation types. The following types of report computation results are output.

Output value	Type of report computation result to output	Report computation type
00H	Invalid data	OFF
01H	INST (instantaneous value)	INST
02H	AVE (average value)	AVE
03H	SUM (summed value)	SUM
04H	MIN (minimum value)	AVE
05H	MAX (maximum value)	AVE
06H	TOTAL (total of the summed values)	SUM

RF0 outputs data on the specified report channels.

MF4 outputs data on the specified report channel.

**Data status**

Outputs the status of the report computation result. The sum of the top numbers of the phenomena from the following items is output.

1H: Detected over-limit data during measurement

2H: Detected special data during sampling

4H: Power failure occurred during computation

80H: Numerical data valid

**Output data**

Depending on the type of report computation, the results are output in the following order.

Computation type: INST (instantaneous value)

G1 to Gn, data H1 to data Hn: Instantaneous value during report creation

I1 to In, data J1 to data Jn: Meaningless data

K1 to Kn, data L1 to Ln: Meaningless data

Computation type: AVE (average)

G1 to Gn, data H1 to data Hn:

Hourly report: Average value of the measured data over 1 hour

Daily report: Average value of the measured data over 1 day

Monthly report: Average value of the measured data over 1 month

I1 to In, data J1 to data Jn:

Hourly report: Minimum value of the measured data over 1 hour

Daily report: Minimum value of the measured data over 1 day

Monthly report: Minimum value of the measured data over 1 month

K1 to Kn, data L1 to Ln:

Hourly report: Maximum value of the measured data over 1 hour

Daily report: Maximum value of the measured data over 1 day

Monthly report: Maximum value of the measured data over 1 month

Computation type: SUM (sum)

G1 to Gn, data H1 to data Hn:

Hourly report: Summed value of the measured data over 1 hour

Daily report: Summed value of the measured data over 1 day

Monthly report: Summed value of the measured data over 1 month

I1 to In, data J1 to data Jn: Total of the summed values since the start of the report

K1 to Kn, data L1 to Ln: Meaningless data

If the data is abnormal, the following value is output at the mantissa of the computed data.

7FFF7FFFH: Positive over-limit data

80018001H: Negative over-limit data

80028002H: Measurement range setting skips

80038003H: The specified channel is not connected

80048004H: Data error

80058005H: Data output not possible

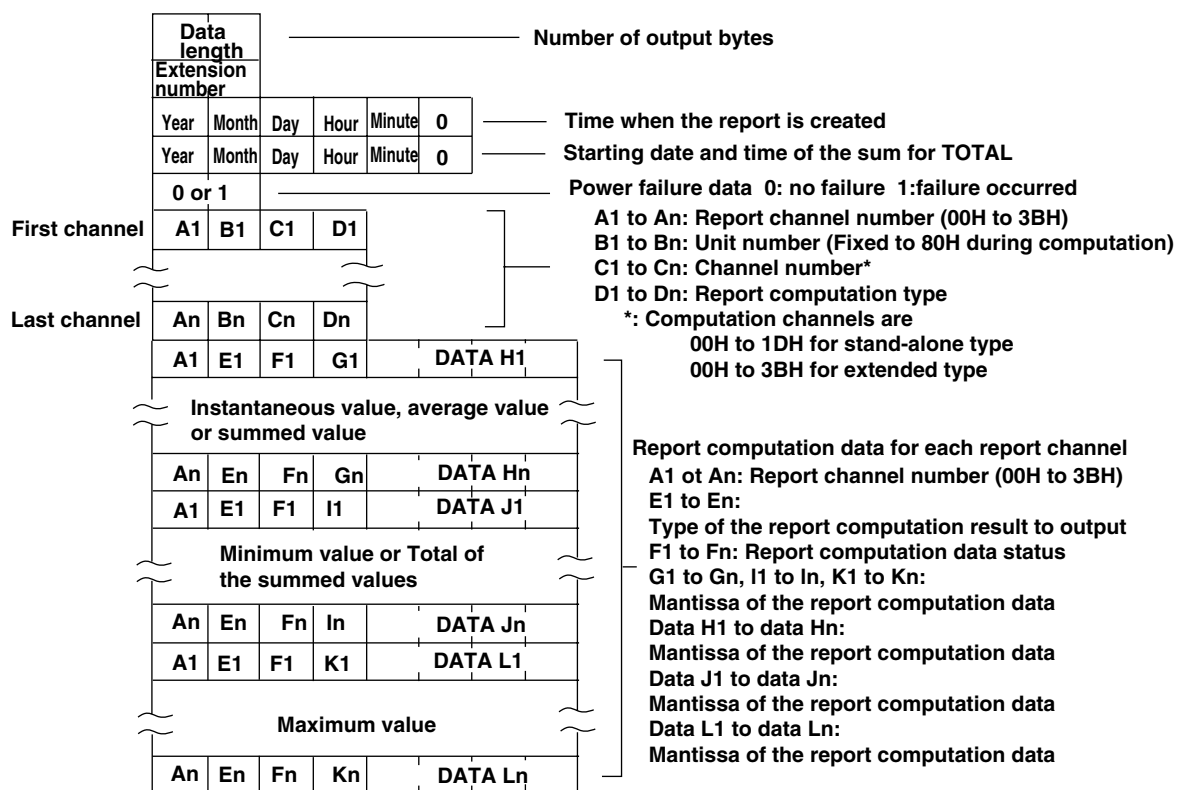
**Note**

- The mantissa of the data length, extension number, power failure information and data can be output from either the upper or the lower byte with the BO command.
- The report channels set to OFF are output in the following way.  
Type of report computation result: 00H (invalid)  
Data status: Meaningless data  
The exponent and mantissa of the data: Meaningless data

## 7.13 Report Output Format

### Daily Report

The daily report is output in the following format with the command, TS4+device trigger(GET)+RF1.  
The daily report file on the built-in RAM disk is output according to the following format with TS3+device trigger(GET)+MF4 command.



The meaning of each data is the same as the hourly report.

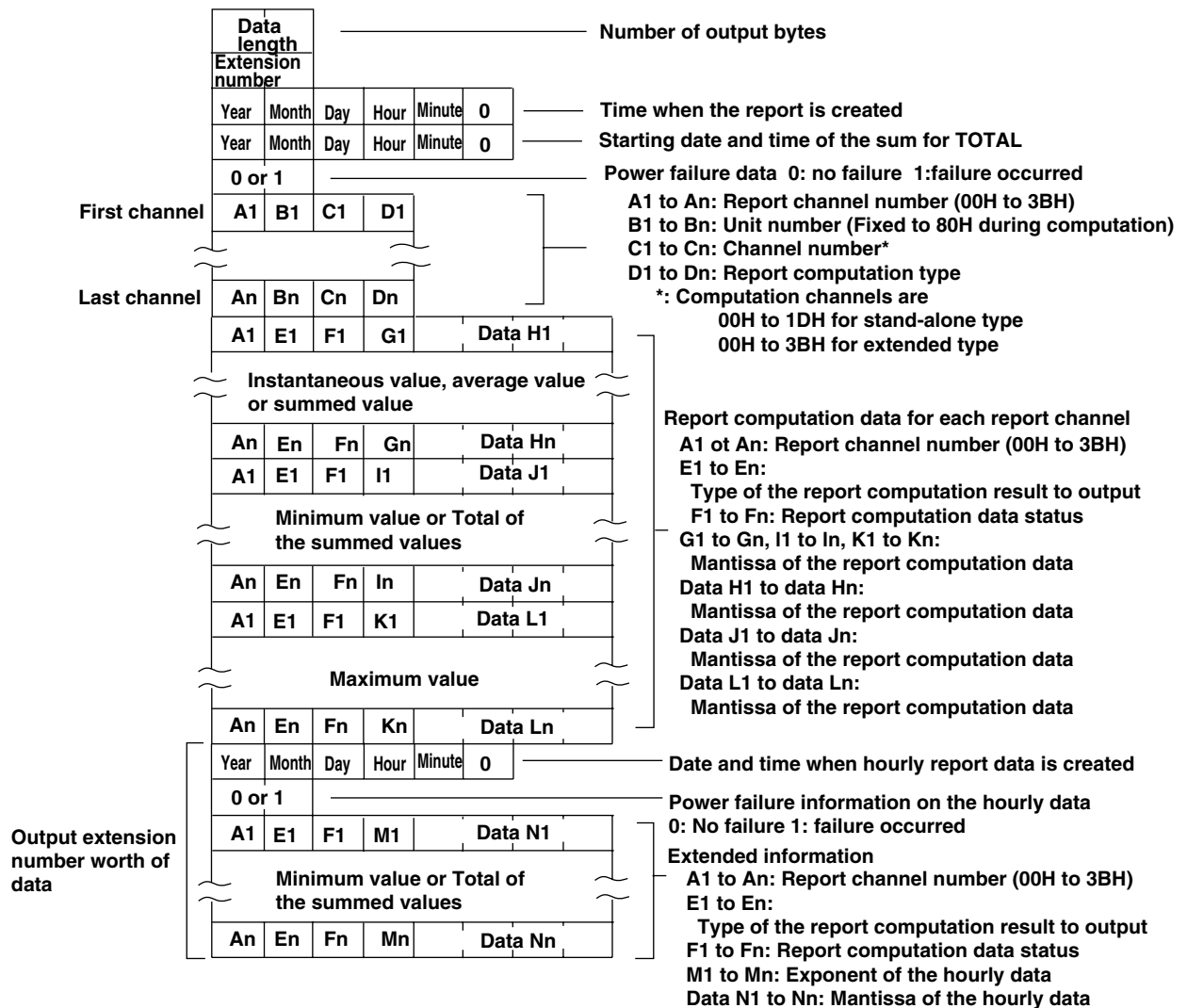
RF1 outputs data on the specified report channels.

MF4 outputs data on the specified report channel.

**Extended format for the daily report**

If the daily report is set to ON2, extended daily report is output in the following format with the command, TS4+device trigger(GET)+RF1.

The extended format for the daily report file on the built-in RAM disk is output according to the following format with TS3+device trigger(GET)+MF4 command.



The meaning of each data is the same as the hourly report.

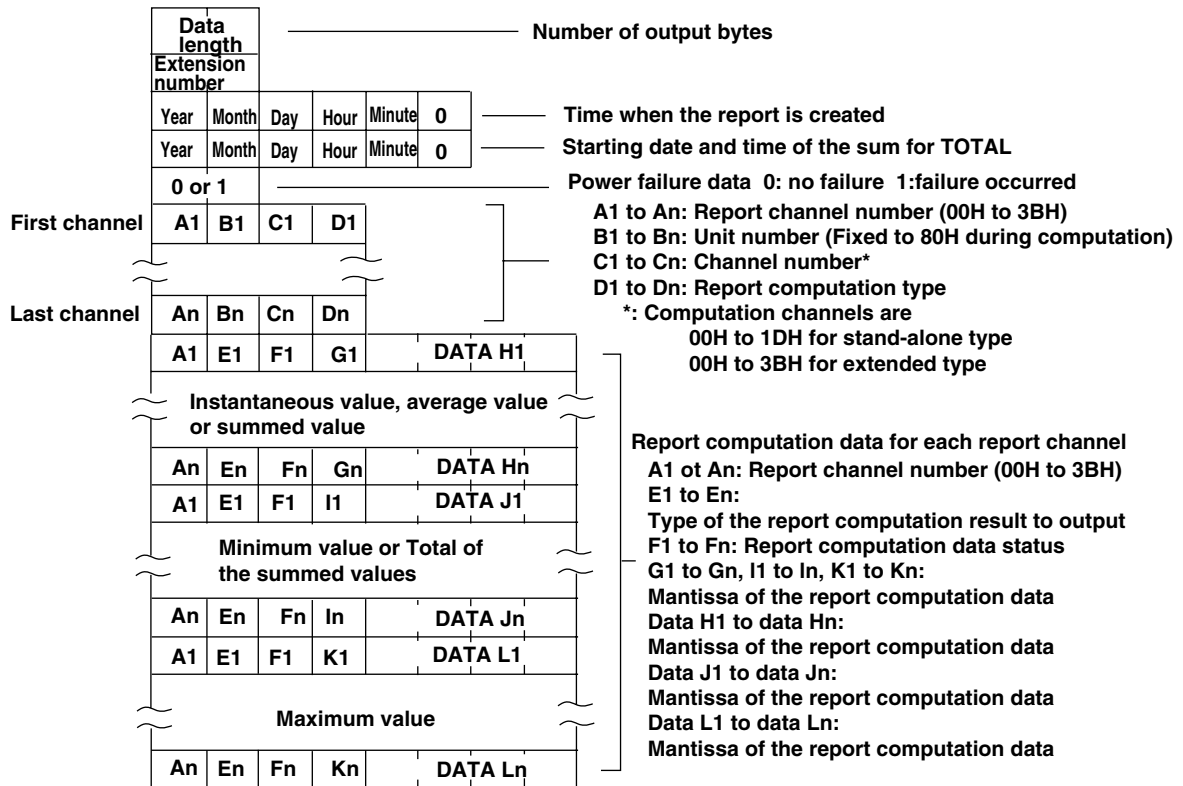
RF1 outputs data on the specified report channels.

MF4 outputs data on the specified report channel.

**Monthly Report**

The monthly report is output in the following format with the command, TS4+device trigger(GET)+RF2.

The monthly report file on the built-in RAM disk is output according to the following format with TS3+device trigger(GET)+MF4 command.



The meaning of each data is the same as the hourly report.

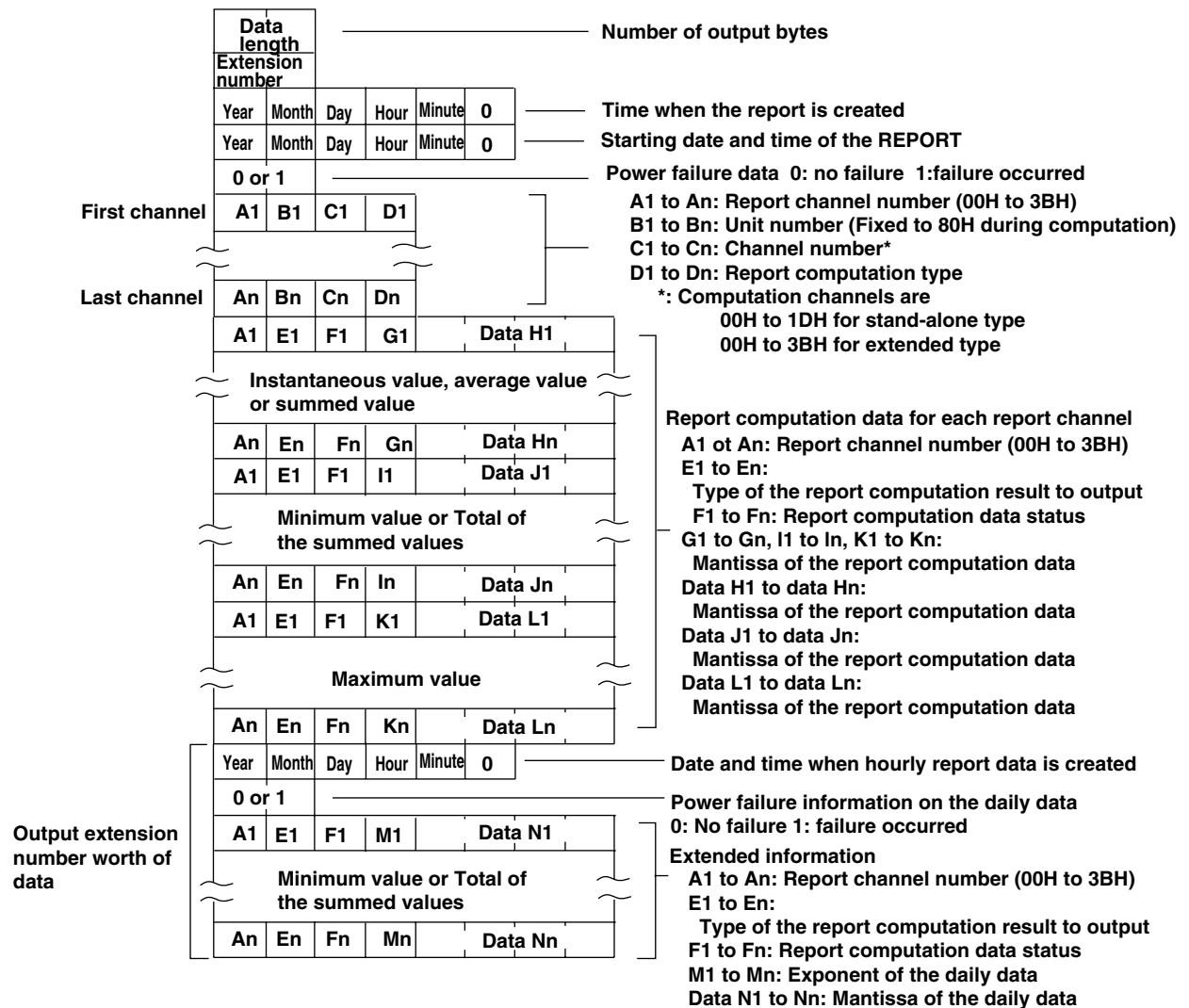
RF2 outputs data on the specified report channels.

MF4 outputs data on the specified report channel.

**Extended format for the monthly report**

If the monthly report is set to ON2, extended daily report is output in the following format with the command, TS4+device trigger(GET)+RF2.

The extended format for the monthly report file on the built-in RAM disk is output according to the following format with TS3+device trigger(GET)+MF4 command.



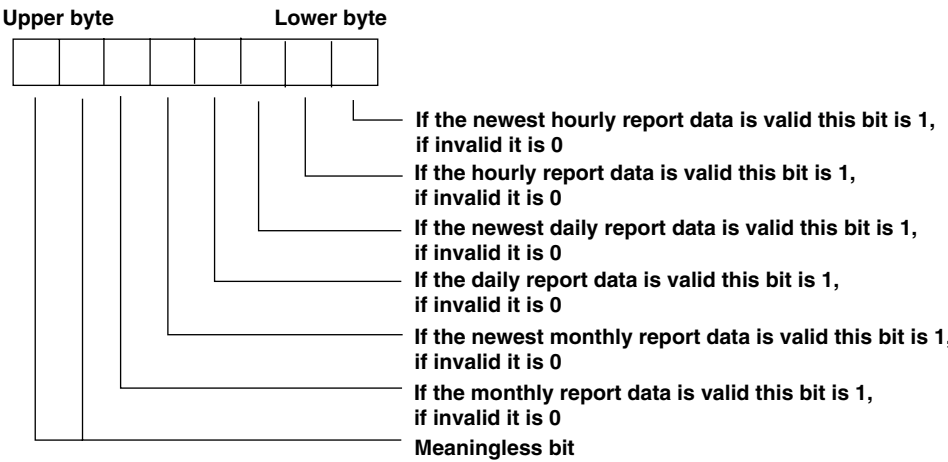
The meaning of each data is the same as the hourly report.

RF2 outputs data on the specified report channels.

MF4 outputs data on the specified report channel.

**Status output of hourly/daily/monthly report**

The status of the hourly/daily/monthly report is output in the following format with the command, TS4+device trigger(GET)+RF3.



**Valid/invalid bit for the newest data**

Using this bit, you can check which report, hourly, daily or monthly report, was created when the internal timer of the status byte operated or when the bit which is generated at the time when the report is created, is turned ON. The report which has the valid/invalid bit set to 1 is the one created. For information on the status byte, refer to page 1-2 or 2-2.

**Note**

Valid/invalid bit for the newest data is reset one hour after the data becomes valid.

## 8.1 GP-IB Sample Programs

This section describes sample program for a system using PC 9801 series (NEC) with National Instruments GP-IB.

Sample programs in this manual are written in N88-BASIC(Standard language for PC9801 series).

We hope that these samples will aid you in creating your own program.

### **GP-IB Address**

ALL the sample programs given in this chapter use address 1 for DC100

### **Setting the personal Computer**

Be carefull when receiving BINARY data that the received data does not overrun the capacity of the receive buffer in the personal computer which may be small as 255 bytes in some case.

### **Output the Setting Data**

Read out the setting data from DC100, display them on CRT of personal computer, and save them to floppy disk.

```
10 'TS1 <GET> LF
20 OPEN "TS1.DAT" FOR OUTPUT AS #1
30 ISET IFC
40 CMD DELIM=0
50 PRINT @1;"TS1"
60 WBYTE &H3F,&H21,&H8,&H3F;
70 PRINT @1;"LF001,010"
80 LINE INPUT @1;D$:PRINT D$:PRINT #1,D$
90 LINE INPUT @;D$:PRINT D$:PRINT #1,D$
100 IF LEFT$(D$,2)<>"EN" GOTO 90
110 CLOSE:STOP
120 END
```

### **Write the Setting Data to DC100**

Read out the setting data from floppy disk, display them on CRT of personal computer, and write them to DC100.

```
10 'SETTEI
20 ISET IFC
30 ON SRQ GOSUB *SSS
40 POLL 1,B
50 SRQ ON
60 OPEN "TS1.DAT" FOR INPUT AS #1
70 ISET IFC
80 CMD DELIM=0
90 PRINT @1;"IM2"
100 LINE INPUT #1,D$
110 IF LEFT$(D$,2)="EN" GOTO 140
120 PRINT @1;D$:PRINT D$
130 GOTO 100
140 CLOSE:STOP
150 END
160 '
170 *SSS
180 POLL 1,B
190 IF (B AND &H42)=&H42 THEN PRINT "SYNTAX ERROR"
200 RETURN
```

### Output the Unit and Decimal Point Data

Read out the unit and decimal point data from DC100, display them on CRT of personal computer, and save them to floppy disk.

```
10  'TS2 <GET> LF
20  OPEN "TS2.DAT" FOR OUTPUT AS #1
30  ISET IFC
40  CMD DELIM=0
50  PRINT @1;"TS2"
60  WBYTE &H3F,&H21,&H8,&H3F;
70  PRINT @1;"LF001,010"
80  LINE INPUT @1;D$:PRINT D$:PRINT #1,D$
90  GOTO 110
100 LINE INPUT @;D$:PRINT D$:PRINT #1,D$
110 IF MID$(D$,2,1)<>"E" THEN 100
120 CLOSE:STOP
130 END
```

### Output the measurement data (ASCII Code)

Read out the measurement data by ASCII code from DC100, display on CRT of personal computer, and save to floppy disk.

```
10  'TS0 <GET> FM0
20  OPEN "TS0ASC.DAT" FOR OUTPUT AS #1
30  ISET IFC
40  CMD DELIM=0
50  PRINT @1;"TS0"
60  WBYTE &H3F,&H21,&H8,&H3F;
70  PRINT @1;"FM0,001,010"
80  LINE INPUT @1;D$:PRINT D$:PRINT #1,D$
90  LINE INPUT @;D$:PRINT D$:PRINT #1,D$
100 IF MID$(D$,2,1)<>"E" THEN 90
110 CLOSE:STOP
120 END
```

**Output the measurement data (BINARY Code)**

Read out the measurement data by BINARY code from DC100, display on CRT of personal computer, and save to floppy disk.

```

10  'TS0 BO1 <GET> FM1
20  OPEN "TS0BIN.DAT" FOR OUTPUT AS #1
30  ISET IFC
40  CMD DELIM=0
50  PRINT @1;"TS0"
60  PRINT @1;"BO1"
70  WBYTE &H3F,&H21,&H8,&H3F;
80  PRINT @1;"FM1,001,010"
90  CMD DELIM=3
100 LINE INPUT @1;D$:PRINT #1,D$
110 A=CVI(MID$(D$,1,2)):PRINT A
120 L=0
130 PRINT ASC(MID$(D$,3,1));PRINT "/";
140 PRINT ASC(MID$(D$,4,1));PRINT "/";
150 PRINT ASC(MID$(D$,5,1));PRINT
160 PRINT ASC(MID$(D$,6,1));PRINT ":";
170 PRINT ASC(MID$(D$,7,1));PRINT ":";
180 PRINT ASC(MID$(D$,8,1));PRINT
190 L=L+1
200 FOR I=6 TO A-1
210 PRINT RIGHT$("0"+HEX$(ASC(MID$(D$,I+3,1))),2)+" ";
220 L=L+1
230 IF L=6 THEN L=0 :PRINT
240 NEXT I
250 CLOSE:STOP
260 END

```

**Output the system configuration data**

Read out the configuration data from DC100, display on CRT of personal computer, and save to floppy disk.

```

10  'TS5 <GET> CF
20  OPEN "TS5.DAT" FOR OUTPUT AS #1
30  ISET IFC
40  CMD DELIM=0
50  PRINT @1;"TS5"
60  WBYTE &H3F,&H21,&H8,&H3F;
70  PRINT @1;"CF0"
80  LINE INPUT @1;D$:PRINT D$:PRINT #1,D$
90  LINE INPUT @;D$:PRINT D$:PRINT #1,D$
100 IF LEFT$(D$,2)<>"E:" GOTO 90
110 CLOSE:STOP
120 END

```

## 8.2 RS-232-C Sample Programs

This section describes sample program for a system using PC 9801 series (NEC) with the RS-232-C interface.

Sample programs in this manual are written in N88-BASIC(Standard language for PC9801 series).

We hope that these samples will aid you in creating your own program.

### Setting the RS-232-C Parameter

In this sample program, the RS-232-C parameter settings are as shown below.

Baud rate        9600  
Data length     8  
Parity    Even  
Stop bit 1  
Handshaking    OFF-OFF

### Setting the personal Computer

Be carefull when receiving BINARY data that the received data does not overrun the capacity of the receive buffer in the personal computer which may be small as 255 bytes in some case.

### Output the Setting Data

Read out the setting data from DC100, display them on CRT of personal computer, and save them to floppy disk.

```
10  'TS1 <ESC T> LF
20  OPEN "COM1:E81N" AS #1
30  OPEN "TS1.DAT" FOR OUTPUT AS #2
40  PRINT #1,"TS1"
50  LINE INPUT #1,D$:PRINT D$
60  PRINT #1,CHR$(&H1B)+ "T"
70  LINE INPUT #1,D$:PRINT D$
80  PRINT #1,"LF001,010"
90  LINE INPUT #1,D$:PRINT D$:PRINT #2,D$
100 IF LEFT$(D$,2)<>"EN" GOTO 90
110 CLOSE
120 END
```

### Write the Setting Data to DR230/DR240

Read out the setting data from floppy disk, display them on CRT of personal computer, and write them to DC100.

```
10  'SETTEI
20  OPEN "COM1:E81N" AS #1
30  OPEN "TS1.DAT" FOR INPUT AS #2
40  LINE INPUT #2,D$
50  IF LEFT$(D$,2)="EN" GOTO 100
60  PRINT #1,D$:PRINT D$
70  LINE INPUT #1,D$
80  IF LEFT$(D$,2)="E1" THEN PRINT "SYNTAX ERROR"
90  GOTO 40
100 CLOSE
110 END
```

**Output the Unit and Decimal Point Data**

Read out the unit and decimal point data from DC100, display them on CRT of personal computer, and save them to floppy disk.

```

10  'TS2 <ESC T> LF
20  OPEN "COM1:E81N" AS #1
30  OPEN "TS2.DAT" FOR OUTPUT AS #2
40  PRINT #1,"TS2"
50  LINE INPUT #1,D$:PRINT D$
60  PRINT #1,CHR$(&H1B)+ "T"
70  LINE INPUT #1,D$:PRINT D$
80  PRINT #1,"LF001,010"
90  LINE INPUT #1,D$:PRINT D$:PRINT #2,D$
100 IF MID$(D$,2,1)<>"E" THEN 90
110 CLOSE
120 END

```

**Output the measurement data (ASCII Code)**

Read out the measurement data by ASCII code from DC100, display on CRT of personal computer, and save to floppy disk.

```

10  'TS0 <ESC T> FM0
20  OPEN "COM1:E81N" AS #1
30  OPEN "TS0ASC.DAT" FOR OUTPUT AS #2
40  PRINT #1,"TS0"
50  LINE INPUT #1,D$:PRINT D$
60  PRINT #1,CHR$(&H1B)+ "T"
70  LINE INPUT #1,D$:PRINT D$
80  PRINT #1,"FM0,001,010"
90  LINE INPUT #1,D$:PRINT D$:PRINT #2,D$
100 IF MID$(D$,2,1)<>"E" THEN 90
110 CLOSE
120 END

```

### Output the measurement data (BINARY Code)

Read out the measurement data by BINARY code from DC100, display on CRT of personal computer, and save to floppy disk.

```
10 'TS0 BO1 <ESC T> FM1
20 OPEN "COM1:E81N" AS #1
30 OPEN "TS0BIN.DAT" FOR OUTPUT AS #2
40 PRINT #1,"TS0"
50 LINE INPUT #1,D$:PRINT D$
60 PRINT #1,"BO1"
70 LINE INPUT #1,D$:PRINT D$
80 PRINT #1,CHR$(&H1B)+"T"
90 LINE INPUT #1,D$:PRINT D$
100 PRINT #1,"FM1,001,010"
110 D$=INPUT$(2,#1):PRINT #2,D$
120 A=CVI(MID$(D$,1,2)):PRINT A
130 D$=INPUT$(A,#1):PRINT #2,D$
140 L=0
150 PRINT ASC(MID$(D$,1,1))::PRINT "/";
160 PRINT ASC(MID$(D$,2,1))::PRINT "/";
170 PRINT ASC(MID$(D$,3,1))::PRINT
180 PRINT ASC(MID$(D$,4,1))::PRINT ":";
190 PRINT ASC(MID$(D$,5,1))::PRINT ":";
200 PRINT ASC(MID$(D$,6,1))::PRINT
210 L=L+1
220 FOR I=4 TO A-3
230 PRINT RIGHT$("0"+HEX$(ASC(MID$(D$,I+3,1))),2)+" ";
240 L=L+1
250 IF L=6 THEN L=0 :PRINT
260 NEXT I
270 CLOSE
```

### Output the system configuration data

Read out the configuration data from DC100, display on CRT of personal computer, and save to floppy disk.

```
10 'TS5 <ESC T> CF
20 OPEN "COM1:E81N" AS #1
30 OPEN "TS5.DAT" FOR OUTPUT AS #2
40 PRINT #1,"TS5"
50 LINE INPUT #1,D$:PRINT D$
60 PRINT #1,CHR$(&H1B)+"T"
70 LINE INPUT #1,D$:PRINT D$
80 PRINT #1,"CF0"
90 LINE INPUT #1,D$:PRINT D$:PRINT #2,D$
100 IF LEFT$(D$,2)<>"E:" GOTO 90
110 CLOSE
120 END
```

## 8.3 RS-422-A/RS-485 Sample Programs

This section describes sample program for a system using PC9801 series (NEC) with the RS-422-A/RS-485 interface. We hope that these samples will aid you in creating your own program.

### Configuration

Model : NEC PC9801 series  
Language : N88-BASIC (Standard programming language on the PC9801 series)  
Wiring system : four-wire system (both four-wire and two-wire systems are introduced in this manual for the ASCII output of the measured data).

### Setting the RS-422-A/RS-485 Parameter

Baud rate : 9600  
Data length : 8  
Parity : Even  
Stop bit : 1  
Address : 01

### Setting the Personal Computer

Be careful when receiving BINARY data that the received data does not overrun the capacity of the receive buffer in the personal computer which may be small as 255 bytes in some case.

### Output the Setting Data

Read out the setting data from DC100, display them on CRT of the personal computer, and save them to floppy disk.

```
10 '
20 OPEN "COM1:E81N" AS #1
30 OPEN "TS1.DAT" FOR OUTPUT AS #2
40 '
50 PRINT #1,CHR$(&H1B)+"O 01"
60 LINE INPUT #1,D$ :PRINT D$
70 PRINT #1,"TS1"
80 LINE INPUT #1,D$ :PRINT D$
90 PRINT #1,CHR$(&H1B)+"T"
100 LINE INPUT #1,D$ :PRINT D$
110 PRINT #1,"LF001,010"
120 LINE INPUT #1,D$
130 PRINT D$
140 PRINT #2,D$
150 IF LEFT$(D$,2)<>"EN" THEN GOTO 120
160 '
170 PRINT #1,CHR$(&H1B)+"C 01"
180 LINE INPUT #1,D$ :PRINT D$
190 CLOSE
200 END
```

***Write the Setting Data to DR series***

Read out the setting data from floppy disk, display them on CRT of the personal computer, and write them to DC100.

```
10  '
20  OPEN "COM1:E81N" AS #1
30  OPEN "TS1.DAT" FOR INPUT AS #2
40  '
50  PRINT #1,CHR$(&H1B)+ "O 01"
60  LINE INPUT #1,D$ :PRINT D$
70  LINE INPUT #2,D$
80  IF LEFT$(D$,2)="EN" THEN GOTO 150
90  PRINT #1,D$
100 PRINT D$
110 LINE INPUT #1,D$
120 IF LEFT$(D$,2)="E1" THEN PRINT "SYNTAX ERROR"
130 GOTO 70
140 '
150 PRINT #1,CHR$(&H1B)+ "C 01"
160 LINE INPUT #1,D$ :PRINT D$
170 CLOSE
180 END
```

***Output the Unit and Decimal Point Data***

Read out the unit and decimal point data from DC100, display them on CRT of the personal computer, and save them to floppy disk.

```
10  '
20  OPEN "COM1:E81N" AS #1
30  OPEN "TS2.DAT" FOR OUTPUT AS #2
40  '
50  PRINT #1,CHR$(&H1B)+ "O 01"
60  LINE INPUT #1,D$ :PRINT D$
70  PRINT #1,"TS2"
80  LINE INPUT #1,D$ :PRINT D$
90  PRINT #1,CHR$(&H1B)+ "T"
100 LINE INPUT #1,D$ :PRINT D$
110 PRINT #1,"LF001,010"
120 LINE INPUT #1,D$
130 PRINT D$
140 PRINT #2,D$
150 IF MID$(D$,2,1)<>"E" THEN GOTO 120
160 '
170 PRINT #1,CHR$(&H1B)+ "C 01"
180 LINE INPUT #1,D$ :PRINT D$
190 CLOSE
200 END
```

***Output the Measurement Data (ASCII Code, four-wire)***

Read out the measurement data by ASCII code from DC100, display on CRT of the personal computer, and save to floppy disk.

```

10  '
20  OPEN "COM1:E81N" AS #1
30  OPEN "TS0ASC.DAT" FOR OUTPUT AS #2
40  '
50  PRINT #1,CHR$(&H1B)+ "O 01"
60  LINE INPUT #1,D$ :PRINT D$
70  PRINT #1,"TS0"
80  LINE INPUT #1,D$ :PRINT D$
90  PRINT #1,CHR$(&H1B)+ "T"
100 LINE INPUT #1,D$ :PRINT D$
110 PRINT #1,"FM0,001,010"
120 LINE INPUT #1,D$
130 PRINT D$
140 PRINT #2,D$
150 IF MID$(D$,2,1)<>"E" THEN GOTO 120
160 '
170 PRINT #1,CHR$(&H1B)+ "C 01"
180 LINE INPUT #1,D$ :PRINT D$
190 CLOSE
200 END

```

***Output the Measurement Data (ASCII Code, two-wire)***

Read out the measurement data by ASCII code from DC100, display on CRT of the personal computer, and save to floppy disk.

```
10  '
20  OPEN "COM1:E81N" AS #1
30  OPEN "TS0ASC.DAT" FOR OUTPUT AS #2
40  OUT &H32,&H5
50  '
60  D$=CHR$(&H1B)+"O 01"
70  GOSUB *RPRINT :GOSUB *RRECIVE :PRINT D$
80  D$="TS0"
90  GOSUB *RPRINT :GOSUB *RRECIVE :PRINT D$
100 D$=CHR$(&H1B)+"T"
110 GOSUB *RPRINT :GOSUB *RRECIVE :PRINT D$
120 '
130 D$="FM0,001,010" :GOSUB *RPRINT
140 GOSUB *RRECIVE
150 PRINT D$
160 PRINT #2,D$
170 IF MID$(D$,2,1)<>"E" GOTO 140
180 '
190 D$=CHR$(&H1B)+"C 01" :GOSUB *RPRINT :GOSUB *RRECIVE
200 CLOSE
210 END
220 '
230 '
240 *RPRINT
250   OUT &H32,&H25
260   FOR K=1 TO 1000 :NEXT K
270   PRINT #1,D$
280   IF (INP(&H32) AND &H4) THEN OUT &H32,&H5 ELSE 280
290   RETURN
300 '
310 *RRECIVE
320   D$=""
330   INCHR$=INPUT$(1,#1)
340   D$=D$+INCHR$
350   IF ASC(INCHR$)<>&HA THEN GOTO 330
360   PRINT D$
370   RETURN
```

- This program is designed for the converter using RS (RTS) for send control.
- BIT 5 is the RS (RTS) control BIT in the XX value of "OUT &H32,&HXX" in the program. Bits other than BIT 5 may be different in other applications.
- Comments on the program are indicated below.
  - Line 40 Set RS (RTS) to FALSE and turn the send control OFF.
  - Line 250 Set RS (RTS) to TRUE and turn the send control ON.
  - Line 260 Insert a wait before sending data. This value need to be adjusted depending on the PC. This wait time is usually not necessary unless the PC is extremely fast and the data sent from the DR side collides with the data sent by the PC side.
  - Line 280 On the send complete indication from the PC (TxEMP is TRUE), set RS (RTS) to FALSE and turn the send control OFF.
  - Line 310 This subroutine accurately reads up to LF.

**Output the Measurement Data (Binary Code)**

Read out the measurement data by BINARY code from DC100, display on CRT of the personal computer, and save to floppy disk.

```

10  '
20  OPEN "COM1:E81N" AS #1
30  OPEN "TS0BIN.DAT" FOR OUTPUT AS #2
40  '
50  PRINT #1,CHR$(&H1B)+ "O 01"
60  LINE INPUT #1,D$ :PRINT D$
70  PRINT #1,"TS0"
80  LINE INPUT #1,D$ :PRINT D$
90  PRINT #1,"BO1"
100 LINE INPUT #1,D$ :PRINT D$
110 PRINT #1,CHR$(&H1B)+ "T"
120 LINE INPUT #1,D$ :PRINT D$
130 PRINT #1,"FM1,001,010"
140 D$=INPUT$(2,#1)
150 PRINT #2,D$
160 A=CVI(MID$(D$,1,2))
170 PRINT A
180 D$=INPUT$(A,#1)
190 PRINT #2,D$
200 PRINT ASC(MID$(D$,1,1)); :PRINT "/";
210 PRINT ASC(MID$(D$,2,1)); :PRINT "/";
220 PRINT ASC(MID$(D$,3,1)); :PRINT
230 PRINT ASC(MID$(D$,4,1)); :PRINT " ";
240 PRINT ASC(MID$(D$,5,1)); :PRINT " ";
250 PRINT ASC(MID$(D$,6,1))
260 '
270 L=0
280 FOR I=7 TO A
290   PRINT RIGHT$("0"+HEX$(ASC(MID$(D$,I,1))),2)+" ";
300   L=L+1
310   IF L=5 THEN L=0 : PRINT
320 NEXT I
330 '
340 PRINT #1,CHR$(&H1B)+ "C 01"
350 LINE INPUT #1,D$ :PRINT D$
360 CLOSE
370 END

```

#### ***Output the System Configuration Data***

Read out the configuration data from DC100, display on CRT of the personal computer, and save to floppy disk.

```
10  '
20  OPEN "COM1:E81N" AS #1
30  OPEN "TS5.DAT" FOR OUTPUT AS #2
40  '
50  PRINT #1,CHR$(&H1B)+ "O 01"
60  LINE INPUT #1,D$ :PRINT D$
70  PRINT #1,"TS5"
80  LINE INPUT #1,D$ :PRINT D$
90  PRINT #1,CHR$(&H1B)+ "T"
100 LINE INPUT #1,D$ :PRINT D$
110 PRINT #1,"CF0"
120 LINE INPUT #1,D$
130 PRINT D$
140 PRINT #2,D$
150 IF LEFT$(D$,2)<>"E:" THEN GOTO 120
160 '
170 PRINT #1,CHR$(&H1B)+ "C 01"
180 LINE INPUT #1,D$ :PRINT D$
190 CLOSE
200 END
```

## 8.4 Ethernet Program

### Configuration

Model	IBM PC/AT
OS	Windows95
Language	Visual-C

### *Output the measurement data (ASCII)*

```
1  /*
2  * DARWIN - PC Communication Program for Winsock
3  */
4  #include <winsock.h>
5  #include <stdlib.h>
6  #include <stdio.h>
7
8  #define IP_ADDR    "133.140.104.204"
9  #define PORT_NUM   34150
10 #define BUF_MAX    4096
11
12 extern int recv_msg(SOCKET so, char *msg, char *buf, int max);
13
14 void main(void) {
15
16     static char * msg[] = {
17
18         "TS0",
19         "\x1bT",
20         "FM0,001,010",
21         NULL
22     };
23     WSADATA    wsa;
24     SOCKET     so;
25     struct sockaddr_in  addr;
26     char        buf[BUF_MAX];
27     int         i;
28
29     if(WSAStartup(MAKEWORD(1,1), &wsa) == 0) {
30
31         if((so = socket(AF_INET, SOCK_STREAM, IPPROTO_TCP)) != INVALID_SOCKET) {
32
33             memset(&addr, 0x00, sizeof(addr));
34             addr.sin_family = AF_INET;
35             addr.sin_addr.s_addr = inet_addr(IP_ADDR);
36             addr.sin_port      = htons(PORT_NUM);
37
38             if(connect(so, (void *)&addr, sizeof(addr)) != SOCKET_ERROR) {
39
40                 for(i = 0; msg[i] != NULL; i++) {
41
42                     sprintf(buf, "%s%s", msg[i], "\r\n");
43
44                     if(send(so, buf, strlen(buf), 0) == SOCKET_ERROR)
45                         break;
46
47                     printf("%s", buf);
48
49                     if(recv_msg(so, msg[i], buf, BUF_MAX) <= 0)
50                         break;
51
52                     printf("%s", buf);
53                 }
54             }
55             closesocket(so);
56         }
57     }
58 }
```

```

56     }
57         WSACleanup();
58     }
59 }
60
61 int recv_msg(SOCKET so, char *msg, char *buf, int max) {
62
63     int    sum = 0;
64     int    len;
65     int    pos;
66
67     for(;;) {
68
69         len = recv(so, &buf[sum], max - sum, 0);
70
71         if(len == SOCKET_ERROR || len == 0)
72             return(len);
73
74         sum += len;
75
76         buf[sum] = '\0';
77
78         if(buf[sum-1] != '\n')
79             continue;
80
81         for(pos = sum-1; pos > 0; pos--) {
82
83             if(buf[pos-1] == '\n')
84                 break;
85         }
86
87         if(!strcmp(msg, "TS0") || !strcmp(msg, "\x1bT")) {
88
89             if((pos < sum-1) && (buf[pos] == 'E'))
90                 break;
91         }
92         else if(!strcmp(msg, "FM", 2)) {
93
94             if((pos+1 < sum-1) && (buf[pos+1] == 'E'))
95                 break;
96         }
97         else break;
98     }
99     return(sum);
100 }

```

Line 8        Sets the DC100's IP address.  
 Line 9        Specifies the port number to connect.  
 Line 16 to 21    Command  
 Line 29        Starts Windows socket (Winsock Ver. 1.1).  
 Line 31        Creates a socket.  
 Line 33 to 36    Sets connection destination. `inet_addr()` and `htons()` are functions used to convert to network format.  
 Line 38        Establishes connection.  
 Line 40 to 54    Sends a command and receives a response.  
 Line 55        Closes the socket.  
 Line 57        Terminates the use of the Windows socket.  
 Line 61        A function to receive ASCII data.  
 Line 69        Receives data from the destination. If the connection is down, `recv()` returns 0.  
 Line 78 to 79    Reads the response data by line.  
 Line 81 to 84    Determines the beginning of the last received line. The first character of the last line is `buf[pos]`.  
 Line 87 to 97    If the response data are final (all responses have been received with respect to each command), return to main.

# App.1 Computing Equation

DC100 can execute computations with the measured data of each input channel taken as a variable, and the results can be displayed/saved (functions available for use only when DC100 has the /M1 option) . The following operators can be used for computation.

## Basic operators

Type	Operator	Example	Description
Addition	+	001+002	Obtain the sum of the measured data of channel 001 and channel 002.
Subtraction	-	002-001	Obtain the difference of the measured data of channel 002 and channel 001.
Multiplication	*	003*K1	Multiply constant K1 to the measured data of channel 003.
Division	/	004/K2	Divide the measured data of channel 004 by constant K2.
Power	**	005**006	Take the power of measured data of channel 005 with the measured data of channel 006.
Absolute value	ABS()	ABS(001)	Obtain the absolute value of the measured data of channel 001.
Square root	SQR()	SQR(002)	Obtain the square root of the measured data of channel 002.
Common logarithm	LOG()	LOG(003)	Obtain the common logarithm of the measured data of channel 003.
Natural Logarithm	LN()	LN(004)	Obtain the natural logarithm of the measured data of channel 004.
Exponent	EXP()	EXP(005)	Make the measured data of channel 005 to be x and obtain $e^x$ .

\* +/- can be used as signs as in -(001).

## Logical operators

Type	Operator	Example	Description
Logical product	AND	001AND002	when channel 001=0 and channel 002=0, "0". when channel 001=nonzero and channel 002=0, "0". when channel 001=0 and channel 002=nonzero, "0". when both channel 001 and channel 002 are nonzero, "1".
Logical sum	OR	001OR002	when channel 001=0 and channel 002=0, "0". when channel 001=nonzero and channel 002=0, "1". when channel 001=0 and channel 002=nonzero, "1". when both channel 001 and channel 002 are nonzero, "1".
Exclusive OR	XOR	001XOR002	when channel 001=0 and channel 002=0, "0". when channel 001=nonzero and channel 002=0, "1". when channel 001=0 and channel 002=nonzero, "1". when both channel 001 and channel 002 are nonzero, "0".
Logical negation	NOT	NOT001	when channel 001=0, "1". when channel 001=nonzero, "0".

## Relational operators

Type	Operator	Example	Description
Equal	.EQ.	001.EQ.002	when channel 001 = channel 002, "1". when channel 001 $\neq$ channel 002, "0".
Not equal	.NE.	002.NE.001	when channel 001 $\neq$ channel 002, "1". when channel 001 = channel 002, "0".
Greater than	.GT.	003.GT.K1	when channel 003 > constant K1, "1". when channel 003 $\leq$ constant K1, "0".
Less than	.LT.	004.LT.K10	when channel 004 < constant K10, "1". when channel 004 $\geq$ constant K10, "0".
Greater than or equal to	.GE.	003.GE.K1	when channel 003 $\geq$ constant K1, "1". when channel 003 < constant K1, "0".
Less than or equal to	.LE.	004.LE.K10	when channel 004 $\leq$ constant K10, "1". when channel 004 > constant K10, "0".

## Specified channel statistical operators

Type	Operator	Example	Description
Maximum value	TLOG.MAX()	TLOG.MAX(001)	Obtain the maximum value of the measured data of channel 001.
Minimum value	TLOG.MIN()	TLOG.MIN(002)	Obtain the minimum value of the measured data of channel 002.
Max-min value	TLOG.P-P()	TLOG.P-P(003)	Obtain the P-P value of the measured data of channel 003.
Total value	TLOG.SUM()	TLOG.SUM(004)	Obtain the total value of the measured data of channel 004.
Average value	TLOG.AVE()	TLOG.AVE(005)	Obtain the average value of the measured data of channel 005.

\* Statistical computation of the measured data for the specified channel performed for an interval from the start of computation to the end of computation. When combining with each of the operators, MAX(), MIN(), P-P(), SUM(), and AVE(), the value that can be specified inside the () is limited to the input channel number or the computation channel number (Example: TLOG.MAX(A01)).

### Statistical operators within the group

Type	Operator	Example	Description
Maximum value	CLOG.MAX()	CLOG.MAX(G01)	Obtain the maximum value of the measured data of group G01.
Minimum value	CLOG.MIN()	CLOG.MIN(G02)	Obtain the minimum value of the measured data of group G02.
Max-min value	CLOG.P-P()	CLOG.P-P(G03)	Obtain the P-P value of the measured data of group G03.
Total value	CLOG.SUM()	CLOG.SUM(G04)	Obtain the total value of the measured data of group G04.
Average value	CLOG.AVE()	CLOG.AVE(G05)	Obtain the average value of the measured data of group G05.

\* Statistical computation of the measured data of the input channel within the same group measured at the same time every specified interval.

### Special operators

Type	Operator	Example	Description
Previous value*	PRE()	PRE(001)	Obtain the previous measured data of channel 001
Hold**	HOLD():	HOLD(001):TLOG.SUM(002)	When the measured value of channel 001 changes from 0 to a nonzero value, maintain the displaying integrated measured data of channel 002 while the measured value of channel 001 is nonzero.
Reset**	RESET():	RESET(001):TLOG.SUM(002)	When the channel 001 = nonzero, reset the integrated value of the measured data of channel 002

\* Previously measured data or computed data. In the case of computed data, the value is set to 0 when the computation is reset. At the start of the computation, if the computation was reset, the value is "0". If it was not reset, the value is the last value of the previous computation. The value that can be specified inside the() is limited to the input channel number (001 to 060) or the computation channel number (A01 to A60). Each computing equation can be used once.

\*\* When specifying HOLD(A):B or RESET(A):B, A and B are channel numbers or computing equations. These can be used once in the beginning of the computing equation.

Computing equations are set according to the following rules.

### The number of computing equations

"30" computing equations for the stand-alone type and "60" for the expandable type can be set. Each computing equation is assigned a number. The numbers are "A01" to "A30" for the stand-alone type and "A01" to "A60" for the expanded type. These numbers are called computation channel numbers.

### Data applicable for computation

The following data is used for computation.

- Measured data: Specified by channel No. (Standard-alone: 001 to 040; Expandable: 001 to 300)
- Computed data: Specified by computation channel No. (Standard-alone: A01 to A30; Expandable: A01 to A60)
- Constant: Value specified for Standard-alone:K01 to K30; Expandable: K01 to K60.
- Group data: Measured data of channels belonging to a group. Specified by group No. (G01 to G07). This is applicable only for CLOG.
- Communication input data: Data written to the instrument's memory via communication interface. Specified by data No. (Standard-alone: C01 to C30; Expandable: C01 to C60)
- Data on internal RAM disk: Measured/computed data saved in the internal RAM disk. Use the following numbers to specify data.

Measured data:

Standard-alone: M001 to M040; Expandable: M001 to M300

Computed data:

Standard-alone: MA01 to MA030; Expandable: MA01 to MA060

### Priority of operators

The priority of operators in a computing equation is as follows. The operators are placed in order from the highest priority.

Type	Operators
Function	ABS(), SQR(), LOG(), LN(), EXP(), MAX(), MIN(), P-P(), SUM(), AVE(), PRE(), HOLD():, RESET():
Exponentiation	**
Signs, logical negation	+, -, NOT
Multiplication, division	*, /
Addition, subtraction	+, -
Greater/less relation	.GT., .LT., .GE., .LE.
Equal/not equal relation	.EQ., .NE.
Logical product	AND
Logical sum, exclusive OR	OR, XOR

### Range when computing

When the value exceeds  $\pm 10^{308}$  during the computation, computation error (overflow) occurs.

### Units in computing equations

In computations, measured data are handled as numbers without units. For example, if the measured data of channel 001 is “20 mV” and the measured data of channel 002 is “20 V”, the computed result of “001+002” becomes “40”.

### Limitations in computing equations

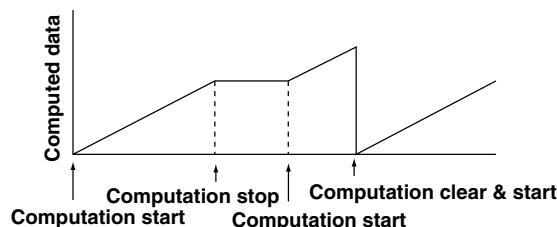
Multiple operators can be used in 1 computing equation. But, there are following limitations.

- Number of characters that can be used : 40 characters
- Total number of channel numbers and constants: 16 (Computation error occurs when 16 exceeded, and the computed result becomes +OVER or -OVER)
- Computation channel numbers: Computation channel numbers less than the current computation channel number can be used as variables within the computing equation.  
Example: A02=001+A01 ← Computation channel numbers greater than or equal to A03 can not be used in this computation.
- Statistical operators (TLOG. or CLOG.) can only be used once in 1 computing equation.

### Control of the computing operation

There is a method to control using the data collection software and the method to control using the event/action function described on the next page.

- Control using the data collection software  
This software allows for the start/stop of the computation, and the clearing of the computed result (select between just clearing or immediately compute after clearing).

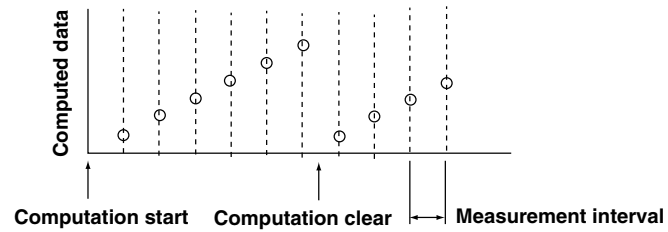


- Control using the event/action function

Can start/stop computations or clear/reset computed results by an event occurring. This function distinguishes clear and reset as shown below.

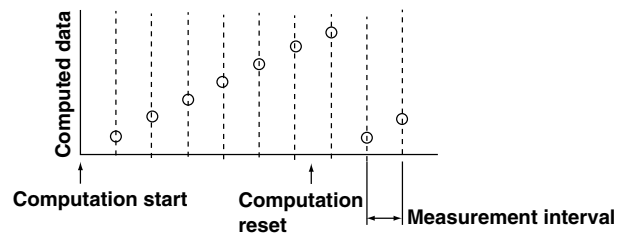
- Clear

When issued during the computation, the measured data is reset before doing the first computation.



- Reset

When issued during the computation, the measured data is reset after doing the first computation.



### Alarm setting for the computation channel

Similar to the standard channels, up to 4 alarm values (levels) can be designated for each computation channel (upper limit alarm / lower limit alarm).

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